





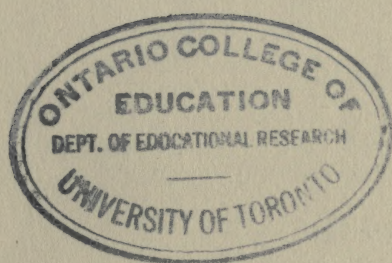
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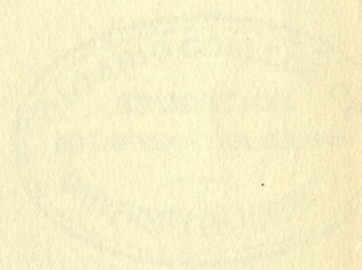
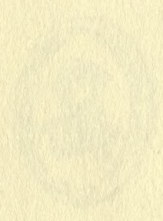
# Experimental Psychology

EDITED BY  
WILLIAM D. HALL, JR., AND  
JOHN A. WATSON

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THE EFFECT OF  
PRACTICE ON THE  
LEARNING OF  
THE MOTOR SKILL OF  
THE HAND

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BY  
WILLIAM D. HALL, JR.  
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# THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

## The Translation Method of Teaching Latin<sup>1</sup>

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AN EXAMINATION of the curriculums of junior high schools located in different sections of the country reveals a striking similarity of purpose on the part of administrators. Generally heads of school systems recognize the important principle that with the beginning of the seventh grade there should be some opportunity for a pupil to choose for himself a part of the work which he is to pursue in school. This differentiation in most cases is slight, and is largely confined to a choice between a foreign language, more extensive work in manual training and domestic science, agriculture, and commercial subjects. The usual practice is to allow not more than one elective to a student entering the seventh grade, and in more instances such an election does not come at the beginning of work in that grade, but at a later time within that year. The bulk of the work for the seventh grade is usually the same for all curriculums.

Included within this list of electives are some of the subjects common to the traditional secondary school, such as Latin, French, agriculture, commercial work, science, history. That these have found a place within the curriculum is undoubtedly due as much to the tradition of the secondary school as to a realization of their proper significance in education and the correct placing of them upon the program. There is a variety of opinions regarding the proper placing of the beginning courses in languages, especially with reference to the question whether they shall be in the seventh grade or in the eighth. They are found placed in both. There is an increasing tendency, however, to introduce the language study at an earlier period, so that the study of a foreign language in the seventh grade is becoming more widespread.

<sup>1</sup>It should be explained that this method of Latin instruction originated a number of years ago in the state of New Hampshire during the time that Professor Henry C. Morrison, of the School of Education, University of Chicago, was State Superintendent of Public Instruction. The method was worked out in a limited number of secondary schools and in the years 1916 and 1917 it was subjected to a searching and critical examination by means of a series of Latin tests and an inquiry into various other factors involved in the work in Latin. The results of this investigation are printed in a monograph referred to in a footnote near the end of this article.



This introduction of a language, like Latin, at such an early period, carries with it certain difficulties which must be met in order to secure good results with children who are as immature as those usually found in seventh grade. Types of work which may be carried on successfully in tenth, eleventh, or twelfth grades, where students are more mature, cannot be carried on at all successfully in the lower grades of the secondary school. There is some agreement among educators that too great emphasis upon drill during the adolescent period is a serious mistake. It is assumed that the mental state of the child does not allow this grinding process to take effect as thoroughly as it will at a later time.

The method of approach, then, must necessarily be changed to fit the development of the pupils. They must be so taught and their mental development so considered, that the subject matter may be acquired by them thoroughly, yet with a minimum of distaste. It is fundamentally right to assume this position, because the state of development of boys and girls at the time they *begin* the study of the language is of prime importance to both teacher and pupil, but more especially to the latter. It is almost impossible to teach Latin to boys and girls of the ages of eleven to thirteen, with the maximum of success, by the methods which have so largely obtained during the past. Learning large vocabularies, committing to memory a great number of forms, learning by rote rules of syntax, such as has been the custom during the past in the ninth grade, is very well calculated to drive the pupil of the seventh grade to despair, as it has also done in the case of many pupils of ninth grade.

Probably the majority of Latin scholars, teachers, and critics would agree that the chief aim in Latin teaching is to acquire the ability to translate Latin into English. The ability to grasp the thought of the Latin author thoroughly and completely is the chief purpose of all work in translation. If the aim is to secure ability to translate, then the method is without doubt clear. From the very first lesson the class should translate a great deal of Latin. If we are to follow logically the lead of modern pedagogy, we are to learn by doing whatever we are studying, as far as that is possible. Therefore, there can be but one way to learn to translate Latin, that is, by *translating latin*. Pupils cannot learn to translate effectively and thoroughly unless they do a great deal of translating in the course of their study. They must not learn so much *about* translating; they must actually *do* the translating. Even a casual

examination of the texts usually employed in teaching first year Latin will show that these books make use of a too small minimum of material for translating.

In startling contrast to the content of the elementary Latin text is the reader used in teaching reading of English to children of first grades. From the very first day of reading the children read. They read a great deal and the more they read the more they learn to read. In primary reading is applied that great basic principle of modern pedagogy, which we have mentioned above, learning by doing. Pupils who are learning to read according to the methods employed in teaching primary reading learn new words in their functional relations. Here we find them taking up each new word in its proper relation within a sentence. Now just what is meant by learning words in their functional relations? Nothing more nor less than that children shall learn to use words exactly as they will use them all their lives, in reading all sorts of printed and written pages. Children learn to read by reading and by recognizing new words as they are associated together within a sentence. They use these words to give them a complete and perfect thought. Without them the thought of the sentence is different, perhaps complete. With them, the whole light of the sentence appears.

It is this method of primary reading which forms the basis of the method of teaching beginning Latin in this article, which is the plan used in the training department of the State Normal School at Oshkosh.

From the beginning the translation of Latin into English constitutes the greater part of each class exercise. To furnish the basis of the first few sentences it is necessary to teach a few words separately. As soon as these first words are taught, not more than three in number, they are woven into a sentence. Each succeeding word is then seen for the first time by the pupils, in a sentence in which all the other words are already familiar. One word at a time is introduced to the class in this fashion, until the entire vocabulary for the day has been taught and studied in this way.

This procedure is based upon the principle analogous to that which has been indicated in a preceding paragraph, that pupils learn to translate most economically when a new word is first seen in its functional relations within the sentence. The new word occupies a place within the sentence which gives it importance. This important position makes such a definite impression upon the pupil



that the word is more easily and efficiently recalled. Very frequently the meaning of the new word is easily grasped from the context in which it stands. But even when this is not true, the new word makes a more lasting impression upon the memory of the child, because it has been used by him to get the whole meaning from the Latin sentence.

A typical first lesson is somewhat as follows: The teacher places upon the blackboard the word *puella*, pronounces it, and each child in turn pronounces it. Its meaning is then given. The same procedure is used with *bona*, then the verb, *est*. Then the sentence, *puella est bona*, is written upon the board. The class reads the sentence and gives its meaning. In this same fashion the following additional vocabulary or words similar, is taught the first day: *patria*, *puer*, *agricola*, *filia*, *filius*, *clarus*, *bonus*, *magnus*, *clara*, *magna*, *quis*. In order more easily and efficiently to secure the distinction between the gender of adjectives, *puer est magnus* is taught before *agricola est magnus*. A great many questions are asked in Latin and the answer given in English. It is a common thing in the first lesson to use between forty and fifty oral and written sentences containing the above vocabulary, or a similar one. Both declarative and interrogative sentences appear the first day. For construction, the nominative singular, agreement of the adjective with the noun, and the agreement of subject and verb are taught functionally in this first lesson.

In the second exercise, a small number of words is added to the vocabulary. The plural nominative and the plural of the verb, *est*, are also taught. As the vocabulary grows a greater number of sentences is possible, and each new word appears to the class for the first time, from this point on, in a sentence composed otherwise of words that are already familiar. At the close of the second exercise a quick review of all words which have been taught up to that time is secured by means of perception cards. Each word in the vocabulary, as soon as it has been taught to the class, is printed with a rubber stamping outfit, in letters about an inch high, on a plain white card. To properly display this list of words one at a time, a small box is placed upon the teacher's desk at the front of the room. On this as a support the cards are placed, face down. In the upper left hand corner of each card, upon the back, is written the word which is printed upon the other side, together with the meaning or meanings of the word which have been taught to the class. The

teacher raises each of the cards in succession to a vertical position upon the box, allows it to remain within clear view of the class for a very brief period, (not a full second of time), and then lowers the card swiftly to a place behind the box. As each card appears the class immediately gives its meaning in English. The amount of time during which the card is visible is an important consideration. In fact, it is the most important consideration in this whole process. The card must be visible the least period of time possible to secure recognition, which must be instant and accurate. This is the only reason for using such a system of perception cards in seventh grade or in any other grade in school. Without instant and accurate recognition there is no lasting benefit resulting from the use of these quick perception cards. The perception must indeed be quick, as as well as accurate, in order to secure for the child the benefits for which it is designed: that is, the *instant* and *accurate* recognition of the meaning of Latin words whenever and wherever seen.

In each succeeding lesson a few additional words are taught, seldom more than six or eight, together with one or two new constructions of syntax. The same procedure as that of the first two lessons holds for all newly taught material, whether it be vocabulary, forms, idioms, or points of syntax. Each new thing is taught in its functional relation within a sentence composed of material otherwise familiar. The names of cases, tenses, rules of syntax, are not given according to the customary classification as found in the usual beginners' Latin textbook. The emphasis is continually upon the functional bearing of each thing as it appears. This method of procedure is based upon the well-known and increasingly accepted fact that children of the age of those usually found in the seventh grade have not yet developed mentally to the point where, to them, scientific classification of grammatical terms has any value.

The distinction between verb forms to denote differences in time is taught by means of the various signs which mark these differences. Pupils soon learn that *ba* means "was" or "were"; that *bi* means "shall" or "will"; that the endings *i*, *isti*, etc., mean a completed action; that *era* means "had done something." It is not found necessary to teach the names of tenses in order that the class may understand the distinctions between the tenses. Neither is it necessary to teach them the rules governing the uses of tenses and cases



in order to enable them to understand these uses. This is simply another exemplification of the well known fact that art precedes science in language as well as in other studies of the curriculum.

It has been thought necessary in the past to teach a large number of words, many rules and idioms, together with complete declensions and conjugations, while at the same time an insufficient amount of Latin was being read and translated by the class to make thorough use of all this grammatical material. Very few textbooks provide enough Latin sentences to illustrate *fully* and *thoroughly* all the various points of syntax taught. Large vocabularies are found in lesson after lesson, while the words are used but once or twice and so are easily forgotten. The theory upon which the average Latin textbook seems to be constructed is that before children can translate Latin they must know all about its important forms, idioms, and grammatical construction, and must have committed to memory a large vocabulary. This all means that the *science* of the language is taught before the *art* of the language. It means further that the language sense, the feeling for sentence wholes, the grasp of thought as conveyed by whole sentences, is not considered a vital necessity. From the first this idea of developing language sense, of teaching the art of the language is subordinated to the memorizing of a great mass of material, all of it to be used at some future date, to be sure, but most of it of no immediate vital interest to children because of this very remoteness of its application. According to this procedure the *science* of language precedes the *art* of language, which is believed to be contrary to the best pedagogy of language study.

It is a universal fact in the history of the race that man has learned to do a great many things, including the expression of his thoughts in oral and written speech, long before he knew exactly why he did them as he did. Children learn to talk, write, play games, read and carry on all kinds of manual activities, and all this with an astonishing degree of accuracy, without ever inquiring or being in the least concerned with the question of why they do as they do. They are not at all interested in the *science* of the thing. They are, however, vitally and absorbingly interested in how to do the thing, and more than that, *in doing it*. In the same way they are most vitally concerned with getting the meaning first and learning about its structure afterward. Grammar is to them not at all necessary, because they have not yet seen its importance, nor can



they find the time or patience to so consider it at their stage of development. These are some of the things which are meant when the phrase is used above to the effect that "art precedes science in language as well as in other studies of the curriculum."

It must not be thought that because of this emphasis upon the art side of Latin study and because there are no labels placed upon cases, tenses, idioms, and constructions, that these are not well taught. Each new idea, form, idiom, construction, as soon as it appears in a sentence, is explained and the same thing appears a sufficient number of times in succeeding lessons to secure its fixation. In addition, each form, idiom, tense, and construction appears in a test given subsequently to determine whether it has been securely fixed in the minds of the pupils.

This emphasis upon the *art* side of language study does not mean that the teaching is of a weak and flabby variety. Probably there is no method of presenting a subject to a class that calls for more concentrated effort on the part of the teacher than just this method that is being described. In the first place this method calls for the collection of a great deal of material that is fitted to the age of the pupil being taught. Then, this material has to be so organized and so presented that every bit of the class exercise is alive for every member of the class. There can be no sleepy moments during the period. An alert teacher and an alert class produces a quality of work that far exceeds the quality possible under the average method. And all the time the translation of Latin is the means employed to teach everything new about the language. Endings have a significance to the pupil because they are shown to have differences in meaning from the ways they are used in each succeeding sentence. Children learn this fact faster for themselves than a teacher could possibly teach it to them because they use both eyes and minds with considerable rapidity. Idioms take on a peculiar significance, because they appear for the first time in an important relation to the other parts of the sentence. This relation is functional, and, therefore, vital.

It is to be noted, further, that some of the leading educational authorities consider it very poor practice to teach formal grammar during the junior high school period. This attitude applies especially to the teaching of formal English grammar, since it has been found that extended and exhaustive study of formal grammar is practically barren of results during this stage of development. Upon this

same ground rests the theory that formal grammar in teaching Latin to junior high school pupils has no place. Thus far this theory proves to be working and workable, because it is now known after several years experimenting, that Latin can be successfully taught to children of seventh grade, without any emphasis upon this side of language study.

To secure interest and to acquaint the class with the fact that Latin has a very broad place in our present civilization several devices are in use. English words derived from Latin are noted from the beginning, a device which has formed an important part of some beginners' texts, and has been used by very many teachers of Latin. The use of Latin words upon coins, state seals, mottoes of graduating classes, and upon trade marks of various well known articles offered for sale, are all called to the attention of the pupils. Latin songs are introduced very clearly and sung with a great deal of pleasure. Among these are the following: *America*, *Gaudeamus* *Igitur*, *Flevit Lepus Parvulus*, *Yankee Doodle*.

As soon as possible there are introduced into the teaching short stories, simple in structure and with an interesting theme. Those which are being used at present comprise a series descriptive of the legendary origin of the name of the Latins, the rise of Rome and the Romans, with their kings, temples, religion, games, social customs and various facts of natural interest to children. The first part of the series has to do with the adventures of Aeneas in escaping from Troy, his wandering on the sea, in Africa and in Italy. Each story develops a special vocabulary, emphasizes idioms, constructions and forms already taught, and uses a minimum of new words or words which will be used infrequently in the later work of the class.

To keep an accurate account of the progress of the class from week to week frequent short tests are given in vocabulary and translation of sentences. Whatever forms, constructions, idioms these tests show are unfamiliar to the class receive attention in subsequent lessons and those weak spots which are discovered by the test method are quickly covered. Graphs of these tests are made and the progress of the class is more readily apparent. From a study of these graphs it is apparent that the class rapidly gains in ability to translate and accurately recall vocabulary. Any words which these tests show have not become firmly fixed in the minds of the class are retained in the card list for rapid oral drill and are



also made the basis of further study in sentences. Subsequent tests using these same words enable the teacher to decide whether the class has finally learned to recall this list of apparently difficult words.

By the method which has been described at some length a considerable vocabulary is gradually acquired. The list of words is made up chiefly from those used in Caesar, because the first extended reading done by the class is from a text, "*Fabulae Faciles*," which employs a Caesar vocabulary. Of the total vocabulary of "*Perseus*," the first story of the "*Fabulae*," there are over 250 words from Caesar which Lodge prints in his selected list of 2,000 words from classical authors usually read. Not all of these 250 words are taught intensively, however.

Nutting's "*First Latin Reader*" is also used as reading material the first year. While this book contains many words not found in any of the classical authors commonly read, the material furnishes no great difficulty on this account, because those words which are not needed for further use are not taught intensively, nor placed upon the perception cards for quick visual review, but are told to the class and then immediately forgotten by the majority of the class. This same statement would be true of any author read. The economy of this method is very apparent at this point. Nothing in vocabulary is learned which will not be used a great deal in subsequent reading. Nothing is drilled which is not to be used continually. Words of rare occurrence consume only enough of the time of the class to fill out the meaning of sentences. They are then passed over as they should be.

The total number of words taught the class through detached sentences, short paragraph stories, and connected reading from texts is at least 500 words for the first year. Each of these words has become the permanent property of the class, not by sheer rote memory, but by associative memory, a better type. Each word has been learned through its relation to other words within a sentence. This close association from day to day between words known and unknown surely accomplishes the desired result: a good vocabulary, thoroughly well in mind, and instantly available. The importance of this single achievement of first year Latin in seventh grade cannot be overestimated. Probably Latin teachers the country over would agree that the greatest single obstacle to success in Latin translation is unfamiliarity with an extended Latin vocabulary. A

student may be perfectly familiar with the meanings of endings, tense signs, and constructions, may know idioms thoroughly, and yet fail to translate Latin well because his vocabulary is imperfectly acquired.

Whenever a new author or a new text is to be studied, the lessons of a few days immediately preceding are devoted to acquiring an acquaintance with the initial vocabulary of the new author. Sentences containing the new vocabulary are used in the class, and idioms and constructions peculiar to the new material also appear in these sentences. The new vocabulary is immediately placed upon perception cards and the class rapidly acquires the new words. The result of this procedure is that the first paragraphs read from the text are mastered without great difficulty and the class is greatly encouraged to continue. The feeling that they can translate Latin is a wonderful incentive to further translation.

Another interesting phase of the first year work is dramatization. This takes the form of simple dialogue in Latin, using the vocabulary already acquired, with such other new words as the story may need to enable it to run smoothly. First, the class decides upon the simple story it shall dramatize. The cast of characters is drawn and placed upon the board. Following this the simple story is written in English, the whole class making suggestions and criticising the form. When this English version is completed, the class then turns the story into a Latin dialogue. Each sentence is worked out on the board, the class directing, the teacher assisting at those points at which the class needs help. The Latin version is subjected to careful criticism and finally is made to suit the class. The teacher suggests such corrections as she deems necessary, and the class amends its work.

When the final draft of the dramatization is completed the class procures its own costumes and properties and presents the simple play before a group of pupils of the school, or before some other audience.

The pedagogy of the dramatization device is this: by means of the Latin dialogue the first and second persons of verbs and pronouns are more easily and effectively taught to children of this age than by any other means. In cases in which the first and second persons of verbs and pronouns are actually used in the class to dramatize an incident with which the class is already familiar, the value of these forms is very apparent. The impression thus



made is deeper than that made by the average means, such as reading, writing or committing to memory by rote. The most lasting impressions in Latin are those which are produced by situations which are themselves brimful of interest and keenly alive, from the standpoint of the child.

Dramatization also furnishes the most vital form of Latin composition, if composition is to be taught at all in this year, at least the written form of composition. It is true that a great deal of simple oral composition is very helpful and stimulating, but it is to be doubted whether any amount of formal written composition is at all necessary or even desirable. Probably more good results from translating a great deal of Latin than comes from less translation mingled with some written composition.

By the end of the first year the seventh grade pupil should have acquired a vocabulary of approximately 500 words of the Caesar vocabulary, besides a thorough working knowledge of the forms of the five declensions, a great many of the commonest idioms, forms of the verb, active and passive, in common use, and a list of about thirty of the most common constructions of Latin grammar. None of these things which are so commonly understood to be classified as Latin grammar has been labeled with its customary Latin name. It has not been taught in that fashion. The class will have read hundreds of simple sentences illustrating all sorts of things in the above list. They will have read between fifteen and twenty short stories, at least two of the "*Fabulae Faciles*," and some of Nutting's "*First Latin Reader*." They will be familiar with several Latin songs, a great number of English words derived from Latin, mottoes from Latin, and some other applied material. The main object of the course will have been attained: the children will have translated a great deal of Latin, carefully graded to agree with their development and of a content that is alike interesting and worth while.

With the second year Caesar is begun. Exactly the same method of approach is used as with previous material used for reading, except that a great deal of the vocabulary does not need to be taught because it has already been learned in the reading of the *Fabulae Faciles*. By using the method of teaching new idioms, phrases, constructions of syntax which was a part of the first year work it is possible to teach these better, because they are to be used immediately in translating the author. It is more economical to

teach the idioms, phrases, forms and constructions peculiar to an author at the time when they are to be used in reading, than to attempt to teach them in one year, expecting them to be efficiently recalled at a later date.

Since a great deal of the work of this year is under the direct supervision and guidance of the teacher, with the pupils working out the new subject matter for the first time in the class, a great deal of the waste which arises from wrong methods of study is avoided. Students are taught to use the vocabulary correctly, to treat whole thoughts, instead of single words, and are gradually led to acquire a maximum speed and accuracy impossible without the guidance of the instructor.

An increasing amount of oral composition based upon the reading from day to day, is a part of the regular program. An occasional written lesson in composition is attempted, but for the most part the dramatization furnishes the more vital composition and the kind that is more important.

The work with perception cards is continued, and those cards which tests show have been mastered, are dropped from the list. They may appear again, however, if any number of the class shows either by its written or oral work that some of the older words are unfamiliar. They may even appear again in sentences upon the board to be taught again in new relationships, following which they will be shown to the class by means of the perception cards for further fixation.

Sentence tests and vocabulary tests are an important part of the second year's work, because they show accurately the words that are not yet acquired and the constructions which need further emphasis. They measure the progress of the class. The work of preparing and correcting these tests is not burdensome and is worth all that it costs because it furnishes a correct diagnosis of the needs of the individual pupils. Further, it diminishes the liability of guesswork on the part of the teacher as to whether the pupils have accomplished what was aimed at in the beginning. Satisfactory tests can be had from several sources or they can be devised by any competent teacher, without great difficulty. Without such tests, the results of the teaching are hazy and some pupils are quite liable to suffer because their wants are not attended to in season and they thereby become more liable to fall behind or even



drop out of the class. If the class can see the graph of its own progress from week to week, it will make a more serious effort to better its own record.

Optional home study is introduced during the eighth year for those students who wish to become better acquainted with Latin. This home work consists entirely of reading from some text not used in the class exercise, or in some portion of the text used in class which will not be read in the class period. There is considerable material of this sort available in such books as "Gradatim," Post's "Latin at Sight," Gallup's "Latin Reader," and several other similar collections of material which is not too difficult for pupils to attempt in the second year of their study. It is essential to the success of this home study that pupils carry on this work without help from any one except the class teacher. This will be readily understood when the great difference is noted between the method of conducting the entire course, from the method generally employed with beginning classes in Latin. No outside influence should interfere with the work the teacher is trying to accomplish in a radically new way of studying the ancient language.

In the ninth year Cicero is read and the work in oral and written composition is based upon Cicero. There is no essential change in method from that used in seventh and eighth grades. Until about the middle of this year, there is no place on the program for any study of formal Latin grammar, and there is no extended drill on forms, either of declensions or conjugations. There is no set of grammatical rules committed to memory. The oral and written composition is of the same type as that of the preceding years, mainly class work, group effort to do correct Latin prose. Constantly throughout this ninth year there is daily practice in recognition of forms, both of verbs, nouns and pronouns, and increasing acquaintance with the important applications of syntax as they have been found to occur in the authors commonly read in the secondary school. "The Syntax of High School Latin," edited by Lee Byrne, is the basis of the choice of syntax to be covered in these years.

During the last half of this ninth year, however, a rapid and thorough study of Latin grammar is carried out. The background of two and a-half years of reading, combined with recognition of the variety of uses of various forms and combinations of forms, makes this grammatical summary more effective. The scientific

classification of grammar is now possible and it takes on meaning, because the child has experienced the uses of grammar and the necessity of understanding correct grammatical structure. Such a procedure is undoubtedly justified on the ground that it makes use of the principle, previously stated, that in no study can the science of that study be understood or appreciated fully until there is a large acquaintance with the art side of the study. Facts invariably precede the laws governing the facts in the experience of mankind. Rules are developed after a great deal of experimenting with processes. Formulas always succeed actions. Just as in the study of science the meaning of a scientific principle is made clearer by examining a concrete application within the experience of the learner, so in the study of the languages, grammar is more effectively studied and more deeply appreciated when it follows a large acquaintance with language. By this method of studying Latin, the pupils have secured a large acquaintance with the language as it is actually used. From this acquaintance the grammatical classifications are rapidly gained.

What are the results of this method? First, the interest of the class is maintained at the highest pitch, the pupils like to translate Latin, they like to study Latin. That this is true is demonstrated by the fact that nearly all the members of the class repeatedly ask to be allowed to read in their Latin readers outside of the class period.

A surer test than this has been made of the value of this method, and the complete results have been published in an extended monograph\* on the subject of Latin teaching and ability in Latin. In this monograph particular attention is called to the following facts: the translation method requires less time on the part of the students, than the old-time grammar method; this saving of time averages slightly over one hundred minutes per week, covering the entire period for which Latin is studied. This single factor of economy of time would greatly justify the use of such a method. By a careful comparison between the results obtained by testing students in school where the grammatical method was employed with the results obtained in schools where the translation method was in use it was found that the students employing the latter method did equally good work in translating Latin. These same tests further

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\*See Brown, H. A. *A Study of Ability in Latin in Secondary Schools*. Published at State Normal School, Oshkosh, Wisconsin.



revealed that students who had been trained by the translation method, with a minimum of work in grammar, were able to do equally good work in the tests in grammar. It, therefore, appears reasonable that a method of studying Latin which secures the interest of the pupils, economizes their time, enables them to read with as great facility as by any other method, and fits them to understand the grammar of the language as thoroughly, is vastly superior as a means of studying Latin.

# The Psychology of Riddle Solution: An Experiment in Purposive Thinking

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## INTRODUCTION.

THE use of riddles as material for an objective study of purposive thinking, or reasoning in its simpler form, occurred to the writer when he was endeavoring to make clear to his classes in psychology the similarity and possible identity which is brought out on a comparison of the method used in this process and the method used in learning by trial and error. Class demonstrations with riddles were later conducted but with no effort immediately directed at standardization of conditions. Out of this grew the present experiment.

In Ladd and Woodworth's *Physiological Psychology*, page 606, we find this statement: "All of these performances, even the most intellectual (perception, analysis, and abstraction, comparison and reasoning) though they differ greatly in content, preserve the method of procedure that was visible in learning by trial and error."

In Thorndike's *Elements of Psychology*, page 265, we have: "This process of attentive consideration and selection or rejection is clearly shown in the search for a proper word to express a meaning, in attempts to solve problems of all sorts from the simplest *riddle* or puzzle to the most abstruse question in mathematics or science and in summoning evidence to support an argument."

While the results of the present experiment may not go very far toward substantiating these statements experimentally, they are presented because the handling of these data makes evident certain tendencies pertinent to the solution of the problem.

This study bears a relation to Ruger's work with puzzles<sup>1</sup> in that both demonstrate the use of the method of trial and error in solving problems. In one case the elements are largely physical and in the other, the solution of riddles, the elements are mental.

It will become apparent, as one follows this experiment, that the results bear out Dewey in his conclusion that "Too few suggestions indicate a dry and meagre mental habit \* \* \* \* On the other hand,

<sup>1</sup> *The Psychology of Efficiency. Archives of psychology, 1910.*



suggestions may be too numerous and too varied for the best interests of the mental habit. So many suggestions may rise that the person is at a loss to select among them \* \* \* \* The best mental habit involves a balance between paucity and redundancy of suggestions."<sup>2</sup>

The use of frequency tables as found in the experiment suggests the frequency tables of Kent and Rosamoff in *A Study of Association in Insanity*, from which some help was obtained.

#### SUBJECTS.

The subjects of this experiment were three hundred and thirty-one young men and women of normal school and college grade with a few high school students, all from representative schools and colleges in the States of Virginia, Iowa and Texas. Most of them were young women. More than these took part in the experiment but because the individuals included in this surplus knew one or more of the riddles their records were discarded. This frequent previous knowledge of any riddle by a subject made the obtaining of sufficient data a slow process.

#### MATERIALS USED IN THE EXPERIMENT.

From a large assortment of riddles of more or less value as material for such an experiment, ten such were selected because of their seeming fairness as mental problems. "C'est qu'il faut distinguer entre les énigmes de mots et les énigmes de choses" was a caution observed at the very beginning. Also those riddles which are capable of only one answer would seem to be best for the purpose in hand. However, ten such could not be found and so besides a few of the most desirable others almost as good were selected. After such a search one concludes that really good and fair riddles are rare and that riddle solution to-day and in recent years cannot be a serious occupation, but must be more of the nature of a diversion with the odds in favor of the propounder of the riddles. This is no denial of the statement of Gaston Paris in his preface to Eugene Rolland's *Devinettes ou Enigmes Populaires de la France*, which is: "Legout des énigmes, des devinettes, pour employer le vrai mot français, est, comme on sait, de toute antiquité, et se retrouvé chez les peuples les plus divers \* \* \* \* qui a joué, a certaines époques, un rôle important dans la religion, dans la philosophie, voire dans la politique."

<sup>2</sup> JOHN DEWEY. *How We Think*. Page 36.

The following riddles were printed on small cards and arranged according to number in small packs of ten:

Riddle No. 1:

If your aunt's sister is not your aunt, then what kin is she to you?

Riddle No. 2:

Use me well and I'm everybody. Scratch my back and I'm nobody. What is it?

Riddle No. 3:

What goes up hill and down hill and yet stands still?

Riddle No. 4:

What is bought by the yard and worn by the foot?

Riddle No. 5:

Always runs and never walks. Has a tongue and never talks. What is it?

Riddle No. 6:

What is it that asks no questions yet requires to be answered many times?

Riddle No. 7:

The more you take away from it the larger it gets. What is it?

Riddle No. 8:

What has neither flesh nor bone yet has four fingers and one thumb?

Riddle No. 9:

What is full of holes and yet will hold water?

Riddle No. 10:

The man who made it wanted to sell it. The man who bought it never used it. The man who used it never saw it.

#### ADMINISTRATION OF THE EXPERIMENT.

The following instructions were carried out by those giving the experiment:

1. The student at his desk is given a set of ten riddles arranged in order and a blank sheet with pencil. He fills out his blank and is instructed not to look at the riddles until the experimenter has given the signal to start.

2. The experimenter calls: "Riddle Number One, Go," and starts a stop watch, allowing the subjects to write all the guesses that come into his mind whether he thinks them right or not.

(The subject has been encouraged to write his guesses down and not to let them pass unrecorded. He should record both right



and wrong guesses. This encouragement is given before the experiment begins and nothing more is said to the subject by the experimenter, except "Riddle Number \* \* \* Go," and at the end of three minutes "Stop.")

3. This is continued until the ten riddles have been tried. After the experiment has been finished the subject fills in blanks calling for total number of guesses for each riddle, on the side, and total number of guesses for all riddles at top of blank.

4. The answers to the riddles are now given and the subject checks off all correct solutions, totals them and puts the total in the blank for number of solutions at the top.

5. In case subject has heard the riddle before and remembers the answer, he is instructed to write in: "I have heard it before," and to record the answer.

6. The blanks are then collected.

Herewith is given a sample record—

Total guesses, 18; Subject Number, 234; Total riddles solved, 4; Date, March 8, 1918.

	NO. OF GUESSES		NO. OF GUESSES
Riddle 1:		Riddle 6:	
First guess, <i>Mother</i> *..	1	1st guess, 'phone, ....	..
Riddle 2:		2d guess, cat, .....	..
1st guess, Match ....	1	3d guess, <i>doorbell</i> ,	3
Riddle 3:		Riddle 7:	
1st guess: Yellow of an		1st guess, blues, ....	..
egg .....	1	2d guess, baby, .....	2
2d guess, churn dasher,	2	Riddle 8:	
Riddle 4:		1st guess, fork, .....	1
1st guess, shoe, .....	..	Riddle 9:	
2d guess, stocking, ...	..	1st guess, air, .....	1
3d guess, leather, ....	3	Riddle 10:	
Riddle 5:		1st guess, <i>coffin</i> , ....	..
1st guess, <i>wagon</i> ,	1	2d guess, shroud, ....	2

\* The italicized guesses were acceptable.

## THE ANSWERS TO THE RIDDLES.

The following responses were arbitrarily taken as the correct answers to the riddles in the absence of experimentally determined answers:\*

RIDDLE	ANSWER	RIDDLE	ANSWER
1	Mother.	6	Doorbell.
2	Mirror or looking glass.	7	A hole or ditch.
3	Road, path or trail.	8	A glove.
4	Carpet, matting or rug.	9	A sponge.
5	A wagon.	10	A coffin or casket.

## TABULATION OF RESULTS.

Upon an examination of the blanks on which were recorded the guesses or trials at the several riddles it was found, as was expected, that some of the subjects made numerous guesses at a single riddle and some made either one guess or none. These guesses were taken as objective evidence of a centrally performed process. Unfortunately many associations aroused by reading the riddles probably were lost to the experiment because of the subject's failure to record them. However, this was unavoidable.

The total number of trials and the total number of correct solutions for the ten riddles for each individual having been ascertained, a tabulation of these data for all the individuals was made in which the total number of guesses of an individual was placed first and opposite it was placed his total number of solutions. But in the tabulation the least speedy guessers come at the top of the column, or series, and the most rapid guessers are at the bottom, that is they end up the series, the order reading from least to most guesses throughout. This gave two columns, one for trials, or guesses, and one for successes.

## INTROSPECTION

In order to introduce the reader to the trial and error character of the method used by subjects performing riddle solutions a few introspections of the best students, those of more mature mind,

(It was hoped that the number of cases would determine to some extent the correct answers, or justify the ones arbitrarily taken, but this was met with disappointment excepting in case of a few of the riddles.



are given below. While these should not be taken as a necessary part of the experiment, they are offered as subjective evidence before beginning the more serious objective treatment.

*Introspection Obtained from Riddle I.*

Subject 332: By thinking of whole family of aunts and different conditions.

Subject 333: I began at first to feel after some unusual relationship and a vague notion of my mother's stepsister came, and then the solution which completely satisfied.

Subject 334: I thought of myself as my niece's aunt and got conclusion from that cue.

Subject 335: I solved by running through my family of aunts and the only one not my aunt was my mother.

Subject 336: First thought of general relation of aunt; cause of relation: concrete thought of a particular aunt, my mother's sister; realization that my aunt's sister is not my aunt but my mother. Doubt as to whether this is true in all cases; idea that it is not true in all cases.

*Introspections Obtained from Riddle II.*

Subject 332: Started thinking of things having backs. Then thought of things with a back which scratching changed: match, chair, book, mirror.

Subject 333: The expression "scratch my back" suggested match-strikers I have seen. Then my thought turned to a different kind of meaning and I tried to find a word that by crossing a "t" at the end would fit. I didn't find it but the words "one," "all" and "crowd" presented themselves.

Subject 334: "Scratch my back" attracted my attention. Match-scratcher flashed into my mind and was instantly rejected. "Scratch" still held the focus of attention. Door-mat came as the result. Rejected as before. I am unable to find the association that caused public opinion unless it be everybody.

Subject 335: I said to myself: "This must be a word—the word 'all.' Can I make a 'k' out of some letter of this word and make nobody? No, I suspect it is not a word, but maybe a match. Or could it be a pig? It is flesh. It lies down like a log. Not certain."

## THE FREQUENCY TABLES

The frequency tables for the several riddles show the number of subjects making any single guess or trial. By way of illustration, in Riddle I the associate "aunt" appears 28 times, "a red ant" is given once and "mother" 227 times. In the frequency table for Riddle II which proved to be the most difficult riddle of the ten, "book," or "a good book" has a frequency of 24, "chicken" has 1, "greenback" has 2, "cat," or "a black cat" a frequency of 31. The so-called correct answer, "looking-glass," or "mirror" has a frequency of 53 while the associate "match" occurs 93 times. In order to economize space all those guesses with a frequency of less than 5 have been omitted from specific mention. They are grouped together under "Miscellaneous."

TABLE I

## RIDDLE I

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
aunt, .....	28	no kin, .....	44	step aunt, .....	7
aunt-in-law, .....	9	not any kin, .....	26	Miscellaneous, (29	
aunt by marriage, ..	9	none, .....	50	guesses, each with	
cousin, .....	24	sister-in-law, .....	15	a frequency of less	
friend, a .....	5	step mother, .....	6	than five), .....	48
mother, .....	227	sister, .....	5	Total, .....	503

TABLE II

## RIDDLE II

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
book, or a good		money, or dollar, ...	14	watch, .....	6
book, .....	24	match box, .....	7	writing tablet, or	
cat, or a black cat, ..	31	match scratcher, ...	18	stationery, .....	8
check, .....	8	paper, .....	5	Miscellaneous, (100	
dog, .....	11	pig, .....	7	guesses, each with	
friend, friends, ....	10	pen, or fountain		a frequency of less	
looking glass, or		pen, .....	5	than five), .....	137
mirror, .....	53	reputation, .....	5	Total, .....	460
match, .....	93	sandpaper, .....	5		

TABLE III

## RIDDLE III

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
air, or atmosphere, ..	11	smoke, .....	5	time, .....	5
fence, .....	23	sun, sunbeam, sun-		water, .....	37
grass, .....	30	light, or sunshine, ..	47	wind, .....	18
man, .....	6	shadow, .....	12	wagon or wagon bed,	9
light, .....	6	soil, .....	5	windmill, .....	5
road (148), or path, ..	193	stream, or brook, ...	5	Miscellaneous, (100	
railroad, .....	6	sidewalk, walk, ....	6	guesses, each with	
riding (1), or man		trees, forest, or		a frequency of less	
in car or man in		wood, .....	18	than five), .....	172
wagon, .....	8	track, or tracks, ....	13	Total, .....	668
river, .....	11	trail, .....	5		



TABLE IV

RIDDLE IV

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
bandage cloth, . . . . .	5	linoleum, . . . . .	6	thread, . . . . .	19
carpet, . . . . .	119	matting, . . . . .	20	wool, . . . . .	7
cotton, . . . . .	12	pavement, sidewalk, . . . . .	5	yarn, . . . . .	29
cloth, . . . . .	16	ribbon, . . . . .	10	Miscellaneous, (57	
dress, . . . . .	14	rug, . . . . .	17	guesses, each with	
floor, or flooring, . . . . .	8	shoe, . . . . .	28	a frequency of less	
hose, stockings, . . . . .	70	silk, . . . . .	9	than five), . . . . .	84
leather, . . . . .	87	shoestrings, or laces, . . . . .	38		
lumber, . . . . .	6	shoe leather, . . . . .	5	Total, . . . . .	633
land, . . . . .	12	socks, . . . . .	5		

TABLE V

RIDDLE V

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
buggy, . . . . .	46	lizard, . . . . .	10	watch, . . . . .	17
clock, . . . . .	43	rabbit, . . . . .	5	water, . . . . .	8
carriage, . . . . .	8	river, . . . . .	23	Miscellaneous, (60	
cart, . . . . .	6	snail, . . . . .	11	guesses, each with	
dog, . . . . .	13	snake, . . . . .	16	a frequency of less	
fire, . . . . .	5	shoe, . . . . .	59	than five), . . . . .	85
grains, . . . . .	26	wagon, . . . . .	254		
				Total, . . . . .	635

TABLE VI

RIDDLE VI

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
baby, or infant, . . . . .	37	door, . . . . .	6	thirst, . . . . .	6
books, . . . . .	7	horse, . . . . .	9	Miscellaneous, (94	
bill, . . . . .	12	hunger, . . . . .	7	guesses, each with	
clock, . . . . .	18	letter, . . . . .	20	a frequency of less	
call, . . . . .	5	nature, . . . . .	5	than five), . . . . .	138
conscience, . . . . .	24	problems, . . . . .	7		
dog, . . . . .	11	telephone, . . . . .	190	Total, . . . . .	616
doorbell, . . . . .	106	time, . . . . .	7		

RIDDLE VII

TABLE VII

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
air, . . . . .	11	knowledge, . . . . .	9	zero, . . . . .	5
book, or books, . . . . .	6	river, . . . . .	12	Miscellaneous, (116	
common fractions, . . . . .	6	lake, . . . . .	7	guesses, each with	
ditch, . . . . .	27	well, . . . . .	26	a frequency of less	
five, . . . . .	5	yeast, . . . . .	5	than five), . . . . .	163
hole in ground, . . . . .	119	water, . . . . .	5		
				Total, . . . . .	442

TABLE VIII

## RIDDLE VIII

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
cradle (wheat), ...	14	glove, .....	134	guesses, each with	
clock, .....	10	pitch fork, .....	9	a frequency of less	
chair, .....	6	rake, .....	6	than five), .....	104
drawn hand, .....	5	skeleton, .....	7		
doll, .....	13	statue, .....	25	Total, .....	340
fork, .....	8	Miscellaneous, (74			

TABLE IX

## RIDDLE IX

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
air, .....	22	ocean, .....	17	tea kettle, .....	8
body, .....	7	pond, .....	8	well, .....	28
clouds, .....	19	river, .....	34	Miscellaneous, (77	
creek, .....	21	sponge, .....	110	guesses, each with	
cloth, .....	16	spring, .....	11	a frequency of less	
earth, .....	38	sprinkler, .....	16	than five), .....	115
ground, .....	33	soil, .....	10		
lake, .....	13	sea, .....	8	Total, .....	546
mouth, .....	5	sifter, or sieve, ....	6		

TABLE X

## RIDDLE X

<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>	<i>Guess</i>	<i>Frequency</i>
air, .....	13	gas, .....	5	Miscellaneous, (111	
bald head, .....	11	patent right, or pat-		guesses, each with	
coffin, or casket, ....	68	ent, .....	12	a frequency of less	
electricity, .....	19	time, .....	5	than five), .....	158
				Total, .....	296

## GROUP GUESSING

Table XI shows for each riddle the number of subjects (a) attempting the riddle, (b) the number solving it, (c) the number failing to solve the riddle, (d) the number failing to record a response, and (e) the total number of guesses for that riddle. To understand the significance of the data given in the last column (e) it must be borne in mind that some subjects guessed three and some four guesses, occasionally to a riddle. Column (f) contains number of different guesses given to any riddle.

This tabulation enables us to determine the most difficult riddle and the easiest one. To ascertain the difficulty of a riddle the per cent of subjects failing to solve it is found. Hence, the number in



(c) for every riddle is divided by the total number of subjects participating in the experiment, *i. e.* 331. Those failing to respond are included in the number of failures as well as those who tried and failed.

TABLE XI  
Showing Group Guessing.

	Number of Subjects.				Total Guesses.	Number of Different Guesses.
	(a)	(b)	(c)	(d)	(e)	(f)
Riddle I .....	324	226	105	7	593	44
Riddle II .....	272	53	278	59	460	121
Riddle III .....	323	169	162	8	668	126
Riddle IV .....	318	134	197	13	633	82
Riddle V .....	325	254	77	6	635	76
Riddle VI .....	315	106	225	16	616	111
Riddle VII .....	278	119	212	53	442	134
Riddle VIII .....	267	134	197	64	340	85
Riddle IX .....	315	110	221	16	546	96
Riddle X .....	199	68	263	132	296	118

TABLE XII  
Showing Riddles Arranged in Order of Difficulty  
(Beginning with easiest which is Riddle V.)

Rank 1.	Riddle V	23.1% of failures.
2.	Riddle I	31.5% of failures.
3.	Riddle III	48.7% of failures.
4.	Riddle IV	59.5% of failures.
4.	Riddle VIII	59.5% of failures.
5.	Riddle VII	63.7% of failures.
6.	Riddle IX	66.4% of failures.
7.	Riddle VI	67.7% of failures.
8.	Riddle X	79.1% of failures.
9.	Riddle II	83.6% of failures.

TABLE XIII

Showing per cent. of unusual guesses and average frequency for each riddle after eliminating the frequency of correct guesses.

Riddle.	Number of guesses oc- curring once.	Percentage of total.	Average Percentage.	No. oc. twice.	Percentage of total.	Average frequency.	Average preceding.
(Least difficult) V .....	44	6.9		13	2.0	5.1	
I .....	19	3.7		8	1.5	6.3	
III .....	58	8.6	6.4	21	3.1	3.9	5.1
IV .....	42	6.6		7	1.1	6.9	
VIII .....	57	16.6		8	2.3	2.5	
VII .....	83	18.7	13.9	20	4.5	2.4	3.9
IX .....	50	9.1		20	3.6	4.5	
VI .....	66	10.7		16	2.6	4.5	
X .....	79	26.7	15.5	21	7.1	1.9	3.6
(Most difficult) II .....	73	15.9	15.9	20	4.3	4.3	3.3

(Table XIII should be read thus: In Riddle V there were forty-four guesses having a frequency of one and these composed 6.9% of the total guesses in that riddle; moreover there were thirteen guesses having a frequency of two and these were 2% of the total guesses. But the average frequency for all the different guesses in that riddle after eliminating the frequency of the correct guess was five and one-tenth.)

### THE DIFFICULTY OF THE RIDDLES

Table XII gives the riddles arranged in the order of their difficulty.

It will be seen from Table XII that the smallest per cent of failures (23.1%) for the group occurred in the effort to solve Riddle V. Hence it is the least difficult riddle of the ten. It will also be seen that Riddle I is somewhat harder, that Riddles IV and VIII are of equal difficulty since they have the same per cent of failures, and that the hardest riddle is Riddle II, for 83.6% of the group failed to solve it. This last riddle is preceded by Riddle X which is almost as difficult.

It might be objected that fatigue entered into the experiment and could account for the falling away in Riddle X since it was the last problem in the series, but this does not account for the extreme difficulty of Riddle II which was the second one given. And, besides, though it is true that 132 subjects failed to record a guess for Riddle X, only 16 subjects failed to record a guess for Riddle IX which preceded it by just about three minutes. From these considerations we cannot say that fatigue caused the falling away in Riddle X. The writer believes this was caused by the extreme difficulty of the situation, or strangeness of the problem.

### THE INFLUENCE OF DIFFICULTY ON GROUP GUESSING

According to our use of the word difficulty, as indicated above, the more difficult the riddle, the smaller are the chances of its solution by the group. But what effect does difficulty have on the association process of the group if we limit the problem to those associations which do not include the correct guess? The writer does not undertake to answer this question, but only to show certain tendencies which seem to obtain in this data.

We turn now to examine guesses other than the correct ones, as given in the Tables I to X. There were forty-three different guesses given for Riddle I besides the correct guess, mother or



its synonym. Nineteen of these were given only once. "Aunt" was given by twenty-eight subjects, "cousin" was given by twenty-three, "sister-in-law" has a frequency of fifteen. For Riddle II there were 121 different guesses made by the subjects. Of the group there were ninety-three who guessed "match," some stopping at that and some, who were dissatisfied with the guess, going on and giving other guesses. Twenty-four guessed "book" or "books." Thirty-one guessed "cat" or "black cat." Eighteen guessed "match scratcher." But seventy-three made guesses which were made by them only. These are rare or unusual associations. We may, for want of a better term, call this unusualness of the first degree. Where a guess was given twice, or by two individuals out of the three hundred and thirty-one, we may call it an unusual guess of the second degree. A guess which has a high frequency would be a very common guess.

The problem now for consideration is to find how difficulty operated on usualness of guessing. We shall examine the data both from the standpoint of usualness, or commonness and that of unusualness. Let us assume that the problem has a two-fold character, *i. e.* (a) What effect does difficulty have on guessing with respect to unusualness of first and second degree? (b) What effect does it have on usualness or commonness of association?

(a) For Riddle V 6.9% of the guesses were of an unusualness of the first degree and 2.3% of them were of unusualness of the second degree; while for Riddle II 15.5% of the guesses were of the first degree of unusualness and 4.3% were of the second degree. We have here examined the least difficult and the most difficult riddles in this respect and find a decided difference between them on this score of unusualness, especially in that of the first degree. The guesses are more unusual in the more difficult riddle.

When we examine the data (see Table XIII) for unusualness of first and second degree in connection with difficulty of riddles as shown in the table mentioned above we find that the data as given does not show a regular increase from riddle to riddle as we proceed from easiest to hardest, but that there are some fluctuations in certain riddles. However, if we combine our data into groups of three and find the average for the group, these groups do show a tendency to increase in unusualness, or rareness, of guesses as the difficulty increases though the case is not so clear in that of the second degree. An examination and comparison of the averages for the groups make this apparent.

(b) As to the effect of difficulty on homogeneity or usualness of guesses an examination of the combined material indicates a tendency for usualness, or average of the frequencies (after eliminating the frequency of correct associations), to decrease. The first group averages 5.1, the second 3.9, the third group 3.6 and the last riddle shows 3.3 alone.

The facts for (a) and (b) are well represented by the following where the average of the respective items of the first three riddles serves as a basis for ratios:

Unusualness of	Easiest three riddles	Next three	Next three	Most difficult
1st degree .....	100	216	242	248
2nd degree .....	100	118	200	195
Usualness or Average frequency .....	100	66	60	56

Conclusion: The above handling of the data justifies the inference that within the limits of these data there is a tendency for associations to be somewhat more homogeneous in easy riddles than in the hard ones and for rare or unusual associations to be less frequent in the easy riddles but more frequent in the more difficult riddles.

#### TRIAL AND SUCCESS

Table XIV presents in abbreviated form the most striking objective facts of the experiment. This is a condensed statement of a more detailed tabulation which is rather too extensive to be given here. The original tabulation was composed of the number of trials, or guesses, for all the ten riddles and likewise of the solutions, for each subject. This was regarded as an array of objective evidence obtained during the performance of the mental process of solving riddles. But this original tabulation was too expanded to show very definitely decided tendencies, hence its condensation.

With the facts of Table XIV before us we may ask ourselves the question: What has guessing to do with solving riddles in this data? In general one might suppose that the more one guesses the more likely he is to succeed and in that case the correct solutions ought to increase with the amount of guesses. That is, total guesses should correlate positively with solutions. But this is not borne out by the data as afforded in the above-mentioned table.



TABLE XIV

Distribution of Guesses with Average Number of Solutions for each Number.

<i>Frequency</i>	<i>Number of Guesses</i>	<i>Average No. of Solutions</i>	
1	5	0.0	0
8	6	2.8	
9	7	3.1	
14	8	3.3	
12	9	3.4	
19	10	4.5	3.4
24	11	4.3	
26	12	4.2	
31	13	4.3	
23	14	5.2	
19	15	5.1	4.6
24	16	4.1	
25	17	4.6	
13	18	4.3	
8	19	4.4	
6	20	4.5	4.4
14	21	3.5	
8	22	3.0	
11	23	4.1	
5	24	4.0	
10	25	4.5	3.8
3	26	3.3	
5	27	5.6	
2	28	3.5	
1	29	1.0	
3	30	5.3	3.7
1	31	3.0	
1	32	3.0	
3	33	2.3	
1	34	2.0	
1	35	3.0	2.7
331			
Ave.	15.5		
A. D.	4.6		
P. E. M.	.21		
Q.	3.7		

It may be said that on the whole the speedy guessers did no better than the slow guessers. From the data in Table XIV we may safely draw the inference that too great speed in guessing is accompanied by ineffectual riddle solving, and that only the moderate guessers are the successful solvers of these problems. Likewise, too low a speed goes with a poor accomplishment as compared with these normal or moderate guessers.

In order to show that the successful participants are normal guessers we give the following statement: Average number of guesses of lowest twenty-five per cent of the cases is 9.0 guesses, with average number of solutions as 3.7; for the highest twenty-five per cent the average number of guesses is 24.1, and the average number of solutions for the same is 3.9. For the interquartile range of the distribution the average number of guesses is 14.7 and the average number of solutions is 4.6. This proves conclusively that the normal guessers are the more successful in the solution of riddles.

#### RARE AND COMMON GUESSES

From the Frequency Tables (I to X) for the riddles given above we find that some guesses occurred but once in the group results for a single riddle and some occurred as many as one hundred and ninety times or even two hundred and twenty-six times. The former would be rare guesses—as we have said above—and the latter would be common or usual guesses.

The question now for consideration is: What effect did slow and rapid guessing have on rare or unusual associations and what effect did they have on common or usual associations as they appear in the data?

An analysis of the material, representing the number of rare guesses to a subject and the average frequency of guesses to that subject, was obtained. The results are given in Tables XV and XVI. To derive such tables all the guesses and their frequencies were arrayed riddle by riddle according to number of guesses and to subjects. It could be seen then how often any subject used a guess with a frequency of 1 or a frequency of 2 or of any other frequency in any riddle.

To obtain Table XV the rare or unusual guesses (1's and 2's) were collected for all the riddles; the average number of 1's (or 2's) to the case was ascertained; and the per cent. of 1's (or 2's) to the guess was found. To find the last-named item the average was divided by the total number of guesses. For instance the number of persons guessing 9 guesses was 12. There were 13 guesses of the 1st degree of unusualness. The average for the group of 12 was 1.1 guesses of the 1st degree of rareness. This 1.1 was then divided by the 9 to obtain the per cent. of rareness of



1st degree to the guess. Such a procedure was carried out for all guesses in the case of both 1st and 2d degree of unusualness and thus the table was obtained.

When we examine the array of data in Table XV with special reference to the influence which speed has on unusualness of either 1st or 2d degree we note that the columns representing the per cent. of 1's (or 2's) incline to have their numbers indicate larger per cents. near the top and the bottom of the columns. But when we take the data in steps of five we find the tendency more clearly shown.

TABLE XV

Showing Per Cent. of Rare Guesses of 1st and 2nd Degree to Each Guess.

No. Guesses	Rareness of 1st Degree		Ave. %	Rareness of 2nd Degree		Ave. %
	Ave. No. of 1's to the case	% of 1's to a guess		Ave. No. of 2's to the case	% of 2's to a guess	
5	1.0	20		1.0	20	
6	.7	11		.3	4	
7	.9	12		.5	7	
8	1.0	12				
9	1.1	12		.3	3	
10	.9	9	11	.4	4	4
11	.4	3		.4	3	
12	.8	6		.9	8	
13	.7	5		.5	4	
14	.5	4		.8	6	
15	1.5	10	6	.6	4	5
16	1.9	12		.9	5	
17	2.0	12		1.0	6	
18	1.8	10		.9	5	
19	2.4	13		1.0	5	
20	2.3	12	12	1.1	6	5
21	2.7	13		1.2	6	
22	3.4	15		1.8	8	
23	4.1	17		1.5	7	
24	4.0	16		2.2	9	
25	3.5	14	15	1.8	7	7
26	3.0	12		2.3	9	
27	4.6	17		1.6	6	
28	6.0	21		1.5	5	
29	4.0	14		5.0	17	
30	4.0	13	15	3.3	11	10
31	6.0	20		2.0	7	
32	5.0	15		4.0	13	
33	8.7	26		2.0	6	
34	7.0	21		3.0	9	
35	9.0	26	22	5.0	14	10

TABLE XVI

Showing Average of "Frequency Values" Reduced to Per Cents  
for Purposes of Comparison

<i>Number of Guesses</i>	<i>Averages of Frequency Values Expressed as Per Cents of Totals</i>	<i>Ave.</i>
5	2%	2%
6	9%	
7	9%	
8	11%	
9	9%	
10	16%	11%
11	15%	
12	14%	
13	14%	
14	15%	
15	14%	14%
16	13%	
17	13%	
18	13%	
19	12%	
20	12%	13%
21	10%	
22	10%	
23	11%	
24	10%	
25	9%	10%
26	9%	
27	10%	
28	8%	
29	6%	
30	11%	9%
31	8%	
32	5%	
33	6%	
34	7%	
35	11%	7%



Table XVI was derived from the same array of figures as the preceding table in which a subject's guesses were expressed in terms of frequencies in any riddle. These were averaged and this average we call "average of frequency values." This was then divided by the total number of guesses made by all subjects in that riddle to obtain a per cent. Having these for all subjects and for all riddles made it possible to secure average percents, for these were averaged and the result in each case was called "average of frequency values reduced to percentages for purposes of comparison." The object here was to obtain some common measure of usualness (commonness or homogeneity) of guesses of each subject for purposes of comparison.

#### CONCLUSIONS

From this experiment some rather definite conclusions follow:

1. One must believe in the trial and error character of the method employed in riddle solutions.
2. Speedy guessing tends, as thus objectively determined, to militate against successful guessing.
3. Rare associations characterize speedy guessing.
4. Usualness or homogeneity of guessing marks the average guessers' associations and is not characteristic of the speedy guessers.
5. Slow guessing is not marked by successful solutions nor homogeneity of associations. However, the unusualness as determined in this experiment is not so great as in the case of speedy guessers.

# An Inquiry Into the Statistical Basis of a Conclusion Concerning Sex Differences

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FOR many years psychologists and educators have been interested in the problem of sex differences in relation to education. Studies dealing with different phases of this subject have been made in America and several European countries. These studies have lacked unanimity of conclusion, however, and have not established laws that psychologists and educators have been ready to accept. It is true that numerous conclusions have been made which have been accepted by many and quoted widely; but at the same time these have been disbelieved and rebutted by others. This article is concerned with the statistical basis of such a conclusion.

In 1915 Yerkes, Bridges and Hardwick published a monograph explaining the derivation and standardization of *A Point Scale for Measuring Mental Ability*. The authors of the scale were convinced that their data showed some pronounced sex differences. The following conclusions are quoted from their monograph:<sup>1</sup> "These two sex groups, although not large, exhibit surprisingly pronounced modes, that for the girls being constituted by the 55 point class—and that for the boys the 65 point class. It appears from these distribution curves that at ten years of age the difference in mental capacity between boys and girls is so great that its neglect would inevitably lead to unfair evaluation of individual results," and <sup>2</sup>"We are fully convinced, however, that the accurate determination of norms for the sexes is eminently desirable, and we suspect that at certain ages serious injustice will be done to individuals by evaluating their scores in the light of norms which do not take account of sex differences."

Two very interesting statistical points are involved in the method by which this conclusion was reached, (1) the wisdom of using the mode as a measure of central tendency and (2) the validity of conclusions drawn on so few data.

The distributions referred to in the above quotation are shown in Table I, Parts 1 and 2.

<sup>1</sup> *A Point Scale for Measuring Mental Ability*. Page 63.

<sup>2</sup> *Idem*. Page 73.



TABLE NO. I

Frequency tables of Point Scale scores for the English speaking, ten-year old children in School "B."

PART I		PART 2 (For Fig. A)		
Ungrouped Data.		Distribution Used by Yerkes.		
Boys	Girls	Interval.	Frequency.	
			Boys.	Girls.
44	39			
48	40	35-39	0	1
52	47	40-44	1	1
54	48	45-49	1	2
54	50	50-54	3	3
56	51	55-59	2	8
58	54	60-64	3	3
60	55	65-69	10	3
61	56	70-74	2	3
63	57	75-79	2	3
65	58	80-84	1	1
65	59			
65	59			
66	59	PART 3 (For Fig. B)		
66	59	Data rearranged—Interval the same size.		
66	59	Interval.	Frequency.	
66	60		Boys.	Girls.
66	60	38-42	0	2
67	60	43-47	1	1
67	66	48-52	2	3
69	67	53-57	3	4
73	67	58-62	3	8
74	72	63-67	10	3
76	72	68-72	1	2
78	74	73-77	3	3
84	74	78-82	1	2
	77	83-87	1	0
	77			
	79			
	80			
		PART 4 (For Fig. C)		
		Size of interval increased to eight.		
		Interval.	Frequency.	
			Boys.	Girls.
		35-42	0	2
		43-50	2	3
		51-58	5	6
		59-66	10	8
		67-74	5	5
		75-82	2	4
		83-90	1	0

These figures were taken from data found on page 53 of the monograph, grouped according to directions on page 61, and express the frequency of scores on the point scale for 53 children, 25 boys and 28 girls. The "surprisingly pronounced modes" can be seen at the "55 point class" for the girls and the "65 point class" for the boys. It is evident from these data that the central tendency for the girls is ten points below that for the boys: hence the authors' generalization concerning sex differences. It is also obvious that this conclusion is based upon a modal value concerning which Rugg says "This specific modal value—depends, within a certain range over the scale, upon the *size* and *position* of class-intervals." Acting upon Rugg's suggestion it is our purpose to change the size and position of the class-intervals and observe the result upon the modes. In the table of frequency given in Table 1, Part 2 the class interval is five. The 55 point class, quoted from the monograph, is made up of scores 55, 56, 57, 58 and 59 and all other intervals are arranged in a like manner. If 55 is made the midpoint instead of the lower limit of a class interval, which includes scores 53, 54, 55, 56 and 57, and a like change is made in the position of all intervals, then we have the distribution given in Table 1, Part 3.

It is evident that by using the same interval but changing its position as we have done the modes have been brought nearer together. We still have two "surprisingly pronounced modes" but they are fifty per cent. closer together; that is, they are now separated by five points instead of ten as before. It is evident that a change in mode has accompanied the change in position of the class intervals. It is our purpose now to change the size of the interval. The authors have grouped five scores together in a class. There is no valid statistical reason why data should be grouped in intervals of five. To illustrate this point the data are grouped in class intervals of eight in Table 1, Part 4. No attempt will be made to justify the use of a class interval of eight with these data because this example is given merely to show how unstable the modal value is.

Here the modes for the two sexes are at the same interval, the boys having a frequency of 10 and the girls a frequency of 8. The conclusions concerning sex differences made by the authors on the basis of the modes shown in Table 1, Part 2, lose half of their

<sup>a</sup> H. O. Rugg. *Statistical Methods Applied to Education*. Page 101.

significance when the data are rearranged as in Table 1, Part 3, and lose all of their statistical basis when the data are arranged in other class intervals as in Table 1, Part 4. Hence, it seems fair to conclude that generalizations made on the basis of modal value have no sound statistical value.

Other averages have been computed for these data and a comparative table of their value is given below.

	<i>Arithmetic mean.</i>	<i>P. E.</i>
Boys, .....	63.9	1.24
Girls, .....	60.8	1.43
Difference, .....	3.1	
	<i>Median.</i>	<i>P. E.</i>
Boys, .....	65.8	1.55
Girls, .....	59.7	1.79
Difference, .....	6.1	
	<i>Mode. (as used by Yerkes).</i>	
Boys, .....	65	
Girls, .....	55	
Difference, .....	10	

It appears from the above that no pronounced sex difference is shown. On the basis of the arithmetic mean or the refined median this difference is slight when the P.E. is taken into consideration.

Two interesting questions can be asked from the standpoint of statistics. (1) Is it fair to make conclusions concerning general differences in mental ability, as judged by the point scale, on the basis of a 3.1 difference in arithmetic mean? (2) Is the point scale method so refined that one can be sure that the P.E. might not be greater than any of the above differences?

The second point concerning the statistical basis of the conclusions we are dealing with has to do with the number of cases considered. Turning to Table 1, Part 2, we find that the modal point for the girls is the 55 point class, and that 8 girls and 2 boys receive such a score. In the same manner it can be shown that a majority of 7 boys are found at their modal point. It is obvious, then, that the conclusions concerning sex differences are made on the basis of 6 girls and 7 boys.



The authors were evidently justified in making their conclusions on the basis of the arrangement of the data as given in the monograph and were also conscious of the limited number of cases considered; but it appears from the rearrangement of the data that no differences between the sexes, as great as indicated by Yerkes, exist.

## COMMUNICATIONS AND DISCUSSIONS

### AGE-GRADE DISTRIBUTION AND INTELLIGENCE QUOTIENT

IN the issue of the JOURNAL OF EDUCATIONAL PSYCHOLOGY for November, 1919, appeared an article on age-grade distribution by Superintendent Ernest C. Witham, of Southington, Conn.

The discussion gives age-grade statistics for several school systems, in each case, the tabulation of over-ageness shows a rapid increase up to the fourth or fifth, and, in one or two cases, the sixth grade, and a corresponding decrease beyond this point.

Undoubtedly any one who has made any continued study of conditions has found the same characteristics with regard to over-ageness. Doubtless most of us have asked the questions that Supt. Witham asks: "What is the reason for so much more retardation in the fourth grade than in any other grade? . . . Is the course of study too difficult for the fourth grade?"

For the past six years I have been noting these conditions, and wondering what can be done to improve them. Naturally, the first thing to suggest itself was better teaching in the lower grades. However, it soon appeared that, while better teaching might help the fourth grade slightly, still the same piling up occurred, and was bound to occur somewhere along the line, if not in the fourth, then in the fifth or sixth.

The establishment of the theory that the distribution of intelligence follows the curve of normal distribution seems to answer the question "why?". If we accept this theory, as, it seems, we must, then there will always be a certain per cent of the pupils of any school who have not the mental ability to complete successfully the work of the fourth grade, another per cent who can do the fourth, but not the fifth, etc. There is also, of course, a certain per cent who cannot successfully complete the work of the first, second, and third grades, but usually these are carried along by the tendency of teachers to promote according to chronological age, and to send pupils whom they know cannot do the work, to the next grade in the hope that they "can get something there," which, of course, is impossible. In this way many of these pupils get to the fourth

grade where they are in such deep water that it is very apparent to every one that they cannot be allowed to go further. There they stay until their age allows them to leave school.

The investigations of Dr. Terman (*Intelligence of School Children*) show that the intelligence quotient, (found by dividing the mental age in months by the chronological age in months, and denoted by I.Q.) changes very little, if at all, in the individual child. Thus a child having an I.Q. of 75 will never attain a mental age of much more than 12, one of 60 I.Q. will never have a mental age of over 10 (9 yrs. 8 mo.), etc. It further appears from Dr. Terman's investigations that a mental age of about 10 is required to do successful work in the fourth grade, 11 in the fifth, 12 in the sixth, etc.

Now, according to the theory of normal distribution, there are about 2% of all children who have I.Q.'s of 60 or less, and who will, therefore, never be able to do successful work beyond grade four, and about 6% more with I.Q.'s less than 80 who can never successfully go beyond the sixth grade. Moreover the 2% above noted cannot do fourth grade work much before the age of 16, and the remaining 6% will have to be the same age to do successfully sixth grade work. All of this group, therefore, stay in the fourth, fifth and sixth grades until they are allowed to leave school.

In support of these statements I submit herewith a survey of the intelligence of the pupils of the Brewster school, from the fourth grade through the high school as measured by the "Otis Group Intelligence Scale."

Brewster is a village of about 2000, inhabited mainly by American born. Not over 5% of the pupils in the school are of foreign born parents. It is similar in population to hundreds of other villages in New York and New England. The school consists of about 450 pupils, from the first grade through the high school. The high school department contains about 65. The Otis tests were given to the whole group within a period of two weeks. All tests except the upper high school were given by the writer. Great care was taken to follow exactly the prescribed procedure, and conditions were identical in each of the tests. One grade was tested beginning about 10:00 a. m., and another about 2:00 p. m. on each day. The high school pupils were tested in two groups the same afternoon, one test being conducted by the principal of the school, who had



previously been present while some of the grades were being tested, and was supplied with a copy of the manual of directions. The results, therefore, are certainly comparable as between grades and individuals.

Assuming the usual figures for the normal age in each grade, viz. 9-10, for grade four, 10-11 for grade five, etc. we find that, of 56 over-age pupils registered in the grades only two are above 100 I.Q., and that, of 23 under-age pupils, only four are below 100 I.Q., and that these four are all above 90 I.Q.

According to our theory, if the pupils of the various grades were viz. 9-10, for grade four, 10-11 for grade five, etc., we find that, grade, a correlation of—1 between the chronological age and the I.Q. The correlations in these grades are as follows; grade 4,—.57, grade 5,—.72, grade 6,—.65, grade 7,—.79, grade 8,—.63. The correlation in the fourth grade is considerably lower than the others on account of the piling up of pupils of low I.Q. If we eliminate the 10 below 70 the correlation in this grade is —.72. In the upper grades the correlation is lower than it should be on account of a number of pupils of high I.Q. who are behind the grade their mental age would entitle them to be in.

THE I.Q. DISTRIBUTION IN BREWSTER H. S.  
TABLE I

	Below 70	70-89	90-109	110-129	130 and Above	Total Cases	Median I.Q.
GRADE							
4	10	10	8	6	1	35	85
5	12	15	4	7		38	79.3
6	4	8	17	3	1	33	95.3
7	3	9	12	12		36	100
8		6	20	13	3	42	105
ACADEMIC							
1		1	13	7	2	23	101.7
2			14	7	1	22	105.7
3			2	5	2	9	120
4			1	3		4	116.7
Total.	29	49	91	63	10	242	95.6

It will be noted that the median I.Q. varies from 79 in the fifth grade to 105 in the eighth, and that for all years of the high school it is above 100. In the seventh grade there are three pupils below 65 I.Q. who have been dragged along by chronological promotions. Aside from these no pupil of this grade is below 80 I.Q. In the eighth grade the two pupils below 80 I.Q. are not able to do the work of the grade successfully, and will probably drop out at the end

of the year. The 17 year old pupil, particularly, has, it must be admitted, plenty of grit to stick to it as long as she has, but what chance has she in competition with the brilliant 12 and 13 year olds in the group?

In the first two years of the high school there are only 3 pupils who have an I.Q. of less than 90, and in the last two years no pupil has an I.Q. of less than 105. This seems to indicate that successful high school work cannot be done by pupils of less than normal intelligence. If this is true our high schools, instead of being the democratic institutions we have always claimed then to be, ("The University of the Masses," they have been called) in reality present an insurmountable obstacle to half of all our children, and that the upper grades automatically shut off a large per cent of children.

TABLE II  
DISTRIBUTION OF 12-YEAR OLDS IN BREWSTER H. S.

	Below 70 I.Q.	70-89	90-109	110-129	130 and Above	Total Cases	Median I.Q.
GRADE							
4	1					1	57.5
5	5	6				11	71.25
6	1	4	8	1		14	94.9
7				3	8	11	114.2
8			3	3	1	7	117.5
Total,	7	10	14	12	1	44	99.99

Table II shows the distribution of 12 year olds. All of these are still in school as they cannot be released on account of the compulsory attendance law. Of the 44, occurring in every grade from the fourth to the eighth, 22 are below 100 I.Q., and 22 are above. All of the 12 year olds in the fourth and fifth grades are below 90 I.Q., and all in the seventh and eighth grades are above 90 I.Q.

TABLE III  
DISTRIBUTION OF 14-YEAR OLDS IN BREWSTER H. S.

	Below 70 I.Q.	70-89	90-109	110-129	130 and Above	Total Cases	Median I.Q.
GRADE							
4	1					1	41
5	2					2	46.5
6	2					2	60
7		4	6	1		11	92.5
8		1	8	2		11	102.5
H. S. 1			4	2	1	7	109.2
2			1			1	102
Total	5	5	19	5	1	35	100.3

Table III shows the distribution of 14 year olds. Seventeen of these are below 100 I.Q., and 18 are 100 or above. The medium I.Q. for the 12 year olds in each grade varies from 57 to 117, and for the 14 year olds, from 41 to 109. The one 14 year old in the fourth and the two in the fifth are not able to do the work of these grades, but have been shoved along by the teachers below who had them for two or three years and had gotten tired of them.

At the time the tests were given, each teacher in the grades was asked to rate her pupils' intelligence on a five point scale as follows: Very Superior=A, Superior=B, Average=C, Fair=D, low=E. Afterward the pupils of each grade were rated on an I.Q. scale as follows: 130 I.Q. and above=A, 110-129=B, 90-109=C, 70-89=D, below 70=E. The correlations between these ratings and the teachers ratings were as follows: Grade 4, .67, grade 5, .60, grade 6, .57, grade 7, .65, grade 8, .62. The general tendency in the lower grades was to rate too high, and in the upper grades to rate too low. Taking into consideration the median I.Q. of the various grades this is easily explained. Each teacher, naturally, rated the individuals in comparison with the whole group. This was her only basis for such rating. The fourth grade, with a median I.Q. of 85 had as many Bs as the eighth grade with a median I.Q. of 105 on the teachers' rating. One or two teachers, in spite of instructions as to what the distribution should probably show, placed the large part of their classes on the extremes, having more As and Ds than Cs. It is hard, too, for the teacher to take the age of the pupil into account; she usually gives old and young pupils the same mark if their class work is about equal.

These being the facts of the case, what is the remedy? If it is going to be impossible to get rid of our high retardation because of this group without sufficient intelligence to do the work of any grade higher than the fourth or fifth, then the only thing for us to do is to see to it that the pupils in the upper part of the I.Q. scale are advanced as rapidly as their intellectual development will allow. In this way we will, at least, have a group of under-age pupils which will balance the over-age group.

The railroad train despatcher has a chart showing the location of every train on his division. By the use of this he is able to keep each one going at its best rate. An age-grade-I.Q. chart will serve



the same purpose in the school. By its use the school executive will be able to pick the individuals who can go faster than the main group and give them a clear track ahead.

For the past three years the writer has experimented somewhat along these lines. The basis of selection has been the Trabue Completion Test. About eight or ten pupils in the Brewster school, and a smaller number in some of the other schools of the county have been "skipped" each year on this basis. But while the correlation between the Trabue scales and the Otis test is high (.60 to .70) there are, of course, several pupils of high I.Q. who have not been recognized by its use.

There are a number of pupils in the school who could profit by skipping a grade. For example, in the fourth grade is a pupil of 169 I.Q., the highest in the school, who has a mental age of about 15 and who, therefore, is able to do first year high school work. There are also three ten year olds in the fourth grade who have higher I.Q.'s than a majority of the ten year olds in the sixth grade. Likewise there are five or six in each of the other grades who can do work one, two, or three years ahead of their present location, and who, now that we have discovered them, will get the opportunity they deserve.

ALLEN J. WILLIAMS.

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Brewster, N. Y.

# The Journal of Educational Psychology

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## EDITORIAL

ONE of the most important elements in the development of educational investigation has been the interest aroused in tests of intelligence. Beginning in 1904 under the masterly insight of Alfred Binet with a loose aggregation of tests to differentiate the mentally defective from the normal, they have been elaborated and refined and adapted to multifarious uses in both war and peace. The fundamental conception on which the earlier Binet scale rested was that of mental age. This assumed that there was a certain measurable increment of intelligence for each year of chronological age, and that this was independent of the specific training that the child had received. This, of course, did not mean that each individual child, or that any individual child, would show just this mentally defective from the normal, they have been elaborated and increment, but if the central tendency of a large number of measure-

ments was taken, this could be accepted as the norm or standard of mental age for any given year of growth. Later investigators found it advisable to have a single mathematical expression for the relation between the measured intelligence of an individual or a given age and the norm for that age. This was called the Intelligence Quotient, and in the hands of Terman and his students has come to be a most significant index of the individual's native capacity. The claim is made that the I.Q. (as it is usually referred to) is practically constant for a given individual at all ages, and that it therefore serves as an index not only to present capacity but of future development.

Whether the mental age, and therefore the I.Q., is a function solely of native intelligence entirely unaffected by experience is open to question. Indeed it is difficult to believe that intelligence of any sort could be purely native. No manifestation of intelligence springs full-fledged into existence. It is always a development of potentialities under the influence of an appropriate environment. Intelligence does not appear in a vacuum. It is only in response to present problems that intelligence exists, and all our responses are modified by experience. Probably what the I.Q. shows is the degree of modification an individual has undergone under an environment relatively common to all. The I.Q. is thus an index of learning under the ordinary conditions of life, and may justly be taken as an indication of future learning.

But the learning that goes on under the common, general environment is only one phase of our development, and not the phase with which the school is directly concerned. The purpose of the school is to provide an artificial environment to accelerate certain types of learning, and while one's general capacity to learn may be of basic importance for success in school learning, the history of the doctrine of 'formal discipline' bids us be cautious in carrying our assumptions of general intelligence too far. In other words, the I.Q. needs to be supplemented by an index of specific school abilities, the E.Q., or Educational Quotient. The development of standard tests to furnish a measure for the E.Q., the combination of these tests into an educational scale, the determination of educational norms for different ages and environmental conditions, the amount of educational change that can be produced in a given time by given means, the correlation between the I.Q. and the E.Q. are



among the interesting problems with which educational investigators are now grappling. One investigator reports already that the E.Q., as determined by a battery of representative tests in school subjects, tends to approach unity much more closely than the I.Q. The reasons for this afford an interesting field for speculation. Perhaps the educational environment, kept under conscious control, offers less opportunity for individual variation than the general environment. Perhaps we are actually succeeding in forcing all our children into the same educational mould. If so, is this a good or an evil? At all events the E.Q. bids fair to open up as many interesting questions as the I.Q., and to be of much greater practical significance for educational procedure.

J. C. BELL.

## NOTES AND NEWS

Charles E. Skinner, of Ohio University, has been elected to the chair of psychology and philosophy at Mount Union College, Alliance, Ohio.

Dr. H. O. Rugg, of the University of Chicago, has been appointed educational psychologist at the Lincoln School, of Teachers College, Columbia University.

Dr. John W. Hall, professor of elementary education in the University of Cincinnati, has accepted the position of dean of education at the University of Nevada.

At the annual meeting of the New York Academy of Sciences, December 15, Dr. Edward L. Thorndike was elected president and Dr. R. S. Woodworth one of the vice-presidents.

Charles L. Harlan, formerly instructor at the college of education of the University of Minnesota, has been appointed director of the newly established bureau of standards and measurements at the State Normal School, Lewiston, Idaho.

Dr. Ellsworth Faris, acting director of the Iowa Child Welfare Research Station during the war, and research professor of sociology at the University of Iowa, has been appointed to a professorship in sociology at the University of Chicago. He is to be in charge of the work in social psychology.

Dr. Walter VanDyke Bingham, director of the division of applied psychology of the Carnegie Institute of Technology, has been

elected first chairman of the Division of Anthropology and Psychology of the National Research Council and has been granted half-time leave until July 1, 1920.

Superintendent Ernest C. Witham, of Southington, Ct., has recently issued a test of South America in his series of Standard Geography Tests. The test is composed of ten questions dealing with the physical, political, industrial and social geography of South America. The standardization of this test will be awaited with interest.

The United States Bureau of Education has established a research station at the University of North Carolina with Dr. L. A. Williams, of the school of education, as director. With a view to cooperation in educational problems, Dean M. C. S. Noble and Dr. Edgar W. Knight, of the School of education, have been named as special collaborators.

Captain Garry C. Myers, of the Army Recruit Educational Center, Camp Upton, N. Y., delivered an address before the Normal School Section of the New York State Teachers Association at Albany, November 26, on "The Application of Group Intelligence Tests to the Schoolroom." After the address Mrs. Myers demonstrated a new group intelligence test designed for school children of all ages.

The December meeting of the New York Society for the Experimental Study of Education was held on December 12, with the general topic of "Problems in the Teaching of Reading." Professor William A. McCall, of Teachers College, spoke on "Reading as a Barometer of School Efficiency," stressing the value of standard measurements in reading as an index of general educational progress, and Professor Thomas H. Briggs, of Teachers College, discussed "The Significance of Silent Reading in Education" with especial reference to the specific training in silent reading that should be given in the schools.

The following is of interest to psychologists, although probably not animated by the spirit of scientific psychology: "The Rev. Dr. William T. Manning, rector of Trinity Parish, New York, offered a resolution in the House of Deputies of the Episcopal Church at the general convention in Detroit, providing for the appointment of a committee 'to consider the fuller recognition of the ministry of healing in the Church and the need of its revival under proper

sanctions and safeguards." The resolution was unanimously adopted and sent to the House of Bishops for concurrence. Dr. Manning has been interested in an English faith healer who has held clinics at Trinity Church.

An appropriation of fifty thousand dollars in five annual payments has been granted to the Iowa Child Welfare Research Station of the State University of Iowa, of which Dr. B. T. Baldwin is director, by the National Women's Christian Temperance Union, for the purpose of making detailed scientific investigation into the development and conservation of child life. The gift is for research and the station will be given a wide range of freedom in the selection of its problems, which will center around the field of eugenics, nutrition, and the mental and social development of the child. Dean Carl E. Seashore is chairman of the advisory committee.

Captain G. C. Myers, now in charge of army educational work at Camp Upton, Long Island, has devised a new test of intelligence denominated the Myers Mental Measure. This scale has grown out of the author's experience in using various form of the Army mental tests, but has also been standardized by extensive use with school children. The claim is made that it measures intelligence in the first school grade about as well as in any other grade, that it correlates highly with the Stanford Revision of the Binet Tests, that it consists wholly of pictures and is therefore applicable to minutes to groups of from ten to one hundred children at a time, illiterates and literates alike, that it can be given in less than 20 that it requires little previous training to give, and that it is easily and rapidly scored by clerical aids. Copies of the scale may be procured from the author or from The Sentinel Press, Carlisle, Pa.

At the annual meeting of Section H, Anthropology and Psychology, of the American Association for the Advancement of science, held at St. Louis, December twenty-ninth and thirtieth, it was announced by the Council that the Section would be divided. Section H in the future will be given over to the anthropologists and the new Section I will be devoted exclusively to psychology.

The following officers of the new Section I were elected:

Professor Edward K. Strong, Jr., Carnegie Institute of Technology, Vice President of the Association and Chairman of the Section; Professor F. N. Freeman, University of Chicago, Secre-



tary, four years; Professor Walter D. Scott, Northwestern University, Member, Sectional Council, 1 year; Professor W. S. Hunter, University of Kansas, 2 years; Dr. J. E. W. Wallin, St. Louis Public School System, 3 years; Dr. Helen T. Woolley, Cincinnati Public Schools, 4 years.

At Brown University a committee on educational advice and direction has been appointed to gather biographical material regarding every student before he enters college. Through correspondence with his parents and school teachers, through personal interviews, and through psychological tests the committee will be informed in the case of every freshman as to his capabilities, tastes, mental peculiarities or deficiencies, his previous successes or failures in scholarship, character, athletic sports, student activities, etc. On the basis of such data the committee will advise him regarding the degree for which he should enter, the choice of elective studies, and the conduct of his personal life. Later in his course—not later than the end of the sophomore year—the committee will again advise him regarding the nature of the chief callings in modern life and the proper concentration of studies in the junior and senior years in order to fit him for the highest service in the world.

The Indiana University Bureau of Cooperative Research has issued an interesting announcement of special projects for investigation during the year 1920. One is the measurement of achievement in algebra. The Rugg-Clark and the Holtz algebra tests are to be given at the completion one half year of algebra work, at the end of one year, and at the end of one and one-half years of work. These scores are to be compared with the teachers' ratings, and special disabilities in algebra work are to be carefully analyzed. Another investigation on the changes in the handwriting of the same pupils as the progress from grade to grade through school will be continued, samples being collected this year from the fifth grades in forty cities. Further applications of the Indiana primer scale, the brief survey scale for grades IV to X, and the more elaborate examination (Schedule D) will be made to determine state norms for diagnostic and administrative purposes, and the reliability of these tests for promotions, sectional groupings, and the placement of pupils. The scales have already been used with over 86,000 children. Another investigation deals with the present salaries and qualifications of teachers in the state.

The twenty-eighth annual meeting of the American Psychological association was held at Harvard University, December 29-31, 1919. Among the papers presented that were of especial interest to educational psychologists were "Are there any Instincts?" Knight Dunlap; "A Comparison of Motor Tests with Estimates of Character, Mental Test Scores, and University Grades," F. A. C. Perrin; "The Average Mental Age of Adults," E. A. Doll; "Superior Intelligence Quotients in Mental Breakdown," F. L. Wells; "A Study of the Intelligence of 250 Delinquent Girls," E. L. Woods; "Ability in Mental Tests in Relation to Reading Ability," L. W. Webb; "Some Recent Work in Mental Tests for College Students," L. L. Thurstone; "Intelligence Tests at Brown University," S. S. Colvin; "Some Notes on Early Imaginative Behavior of Children," G. C. Myers; "Variations in Mental Equipment not indicated by an Intelligence Ratio," A. F. Bronner; "Evaluation of School Attainment in Terms of Mental Ability," R. Pintner; "A Study of Factors Other than General Intelligence, Important for the Prognosis of School Success," S. L. Pressey; "Results Obtained on the First Three Grades by Means of a Group Scale of Intelligence," L. C. Pressey; "Psychological Tests in the Training of Teachers," E. A. Kirkpatrick; "The Combined Use of Mental and Educational Tests, Illustrated in the Case of Language," Daniel Starch; "The Cooperation between Interests and Abilities in College Courses," J. W. Bridges; "What Industry Wants and does not Want from Psychology," E. P. Frost; "An Important Constant Error in Psychological Rating," E. L. Thorndike; "The Extension of Rating Scale Theory and Technique," B. Ruml and D. J. Patterson; "Recent Development in Trade Test Theory," A. Kornhauser and B. Ruml. The Presidential Address, by Dr. Walter Dill Scott, was on the subject "Changes in Some of our Conceptions and Practices of Personnel." Dr. Sheperd I. Franz was elected president for the ensuing year.

## PUBLICATIONS RECEIVED

RUDOLPH PINTNER. *Aesthetic Appreciation of Pictures by Children*. Reprinted from the Pedagogical Seminary, Vol. 25, 1918. Pp. 216-218.

Children from six to fourteen years old were asked to arrange six pictures in order of their preference for beauty. Their judgments conform closely to the aesthetic standards of adults. The conformity develops gradually, being well marked in children of seven years and practically completed at the age of ten.

RUDOLPH PINTNER. *Intelligence as Estimated from Photographs*. Reprinted from the Psychological Review, Vol. 25, 1918. Pp. 286-296.

Teachers, physicians, psychiatrists and others claim that they are able to judge of the intelligence of a person by looking at him. To test this, twelve children were examined for their intelligence by the Yerkes-Bridges scale and their photographs were then ranked for intelligence by nine physicians, fifteen psychologists, eleven students, seventeen teachers and eleven miscellaneous individuals. The coefficients of correlation were all low, the highest being  $+ .31$  by the psychologists. The physicians averaged only  $+ .11$  and the teachers  $+ .17$ . The author believes that the correlations would not have been much higher if the children themselves had been inspected instead of the photographs. Judgments of intelligence are unreliable unless made with reference to an objective criterion.

RUDOLPH PINTNER. *The Mental Indices of Siblings*. Reprinted from The Psychological Review, Vol. 25, 1918. 252-255.

In the course of extensive school surveys it was found that children from the same family showed an appreciably higher association coefficient in six standard tests than children taken at random. The fact that the coefficients were not as high as those obtained by other investigators is probably due to the inadequacy of the rough survey tests.

RUDOLPH PINTNER AND HERBERT TOOPS. *A Chart for Rapid Computation of Point Scale Scores*. Reprinted from The Journal of Delinquency, Vol. 2, 1917. Pp. 209-210.

This is a chart of coefficients of mental ability, with indications of Yerkes-Bridges scores, chronological ages, and mental ages so arranged as to show at a glance the mutual relationships. The chart is printed in colors, yellow indicating very bright, red-bright, white-normal, blue-backward, and green-feeble-minded.

RUDOLPH PINTNER AND HERBERT TOOPS. *A Drawing Completion Test*. Reprinted from the Journal of Applied Psychology, Vol. 2, 1918. Pp. 164-173.

Twenty-five outline drawings of familiar objects, each of which has some part missing, were presented to about 1400 children from five to sixteen years of age with the request to indicate the missing part. The pictures are then ranked according to the percentage of correct indications.

A POROT ET A. HESNARD. *Psychiatrie de Guerre. Etude Clinique*. Paris: Librairie Felix Alcan, 1919. Pp. 315. 6 francs.

Now that the shock of war is over and the insistent demands upon men of science for immediate action are relaxed, opportunity is given to take account of stock and to evaluate the data brought out by the war in terms of their significance for times of peace. The present work gives a birds-eye view of the whole field of war psychiatry from the battle-line, the camps, the marine barracks, to the hospitals and the sanatoria. Perhaps it is true that there is no "war psychiatry" in the sense of novel disease syndromes, but the physical and emotional strain of the struggle was such as to bring into sharper outline the details of mental disturbance and to hasten the development of the ordinary stages of psychoses. The authors consider the effect of war upon morbid predispositions, the reactions of different races to war stresses, the clinical syndromes of mental



confusion, the amnesias, the phobias, the psychasthrenias, delirium, mania and choses. The development and course of the disturbances are studied and suggestions are made for an enlightened psychiatric therapy. There is a bibliography of 24 pages.

S. D. PORTEUS. *Cephalometry of Feeble-Minded*. Reprinted from the Training School Bulletin, June, 1919. Pp. 1-24.

In 1918 the author published percentile tables of the brain capacity of 9000 normal individuals from eight years to maturity. The present study compares the first fifty unselected cases from the Vineland Training School with these norms. Seventy-two per cent of these cases were found to lie outside the normal limits of head form or size. Some of these were larger than the normal, but by far the greater number were smaller. Nothing is said in this article about the type or degree of feeble-mindedness. It would be of interest in future studies of cephalometry to take account of these differences and to try to connect certain types of mental defect with specific cranial abnormalities.

S. D. PORTEUS. *Porteus Tests—The Vineland Revision*. The Vineland Training School, Department of Research, 1919. Pp. 44.

"There is an urgent need for tests which will evaluate those characteristics which are most essential to social success, and which are not tested by the Binet Tests. Amongst these capacities are forethought and planning capacity, prudence and mental alertness in meeting a situation new to experience. The Porteus tests largely meet this need. The graded maze has many advantages as test material, chief being that it provides a problem which, because of the capacities required for success, approaches most nearly a real life situation." The tests have been standardized by application to 2453 children, and developmental curves are given for the ages of six to thirteen in both the Porteus and the Binet tests and in height, weight, grip and vital capacity.

SYDNEY L. PRESSEY. *A Comparison of Two Cities and Their School Systems by means of a Group Scale of Intelligence*. Reprinted from Educational Administration and Supervision, Vol. 5, 1919. Pp. 53-62.

The two cities averaged much the same in pupil material, but different parts of the same city showed as much as a year of difference in mental age. Grade standards in schools differ widely. Two grades in one city stood above the average of the next higher grades in the other city. Surveys of mental endowment are quite as important as measures of achievement in educational investigations.

SYDNEY L. PRESSEY AND LUELLA W. COLE. *Irregularity in Psychological Examination as a Measure of Mental Deterioration*. Reprinted from The Journal of Abnormal Psychology, December, 1918. Pp. 12.

Between the mental ages of eight and twelve the feeble-minded show an average irregularity of 17 points on the Yerkes Point Scale, dementia praecox 20 points, and chronic alcoholics 22 points. Wide irregularity is, therefore, presumptive evidence against feeble-mindedness, and five particular tests of the scale give a diagnostic unit of great value in distinguishing aments from the psychotic.

*The Public School System of San Francisco, California*. Washington: Bureau of Education, 1917. Pp. 649. \$0.60.

Chapter seven of this report is devoted to "Tests of the Achievements of Pupils." Selected classes in elementary schools were tested in penmanship, spelling, reading and arithmetic. In penmanship no attention was paid to rate, and the score in form was based on the pupils' copy of a stanza written on the blackboard. The specimens were scored by the Ayres scale, and the showing was distinctly above the average of 55 cities in all but the seventh and eighth

grades. From the fifth grade on there was no appreciable improvement in form. In spelling ten words were selected from the Ayres scale for each grade such that 73 per cent of the grade was supposed to pass them. The average for the grades was from eight to ten points above the Ayres standard. The Thorndike Scale Alpha 2 was used in reading, and each grade was found appreciably above the standard. The range for the same grade in different schools was very wide. In arithmetic the Coartis Series B and the Stone reasoning tests were used, and over twenty pages are devoted to the discussion of the results. San Francisco children rank high in speed on the fundamentals, but are not so good in accuracy, and in reasoning they are distinctly below the standard.

PHIL AND NELLIE RAU. *Wasp Studies Afield*. Princeton: University Press, 1918. Pp. xv, 372. \$2.00.

These delightful accounts of wasp life and habits deserve to rank with the work of the Peckhams and that of the immortal Fabre. In painstaking accuracy of observation and record, in the abundance and variety of illustrations, and in the intimate and fascinating charm of the style the book is the equal of anything that those writers have produced. These are not the imaginative tales of the easy-chair naturalist, but rest upon weeks and months of the most arduous and exacting field studies. They constitute a most welcome and valuable addition to our knowledge of animal psychology.

CHARLES R. RICHARDS. *The Gary Public Schools. Industrial Work*. New York: General Education Board, 1918. Pp. xix, 204. Twenty-five cents.

There are no standard tests or scales in shop work. The lack of standard measures of industrial work makes itself keenly felt in such a school survey as that of Gary. In lieu of them the surveyor had to devise practical tests of his own, which to be sure are of distinct value in comparing pupil with pupil and school with school, but give little idea of the standing of the pupils with reference to any other group. It would seem that some of these tests might be standardized so that they would be available for wider use.

NORMAN E. RICHARDSON. *Religious Education and Reconstruction*. New York: The Abingdon Press, 1919. Pp. 32.

A survey of German conditions leading up to the war, an appeal for the closer union of the sciences and the humanities in education, and a program for religious education that will ensure the moral and religious upbuilding of the American people.

ROY FRANKLIN RICHARDSON. *The Psychology and Pedagogy of Anger*. Baltimore: Warwick and York, 1918. Pp. 105. \$1.25.

This is an introspective study of anger as it manifests itself in everyday life. Ten graduate students of Clark University and two persons outside the institution agreed to make detailed introspective records of every state of anger for three months. The present account organizes the records under the headings of the mental situations stimulating anger, the behavior of consciousness during anger, and the characteristics of the disappearance of anger. From this account the stimulating and regulatory effects of anger are deduced, and the significance of anger in education is derived. A mild, controlled form of anger is one of the most potent stimuli to persistent and successful effort.

WILLIAM EMERSON RITTER. *The Unity of the Organism*. Boston: Richard G. Badger, 1919. Two Volumes, Vol. I, Pp. xxix, 398; Vol. II, Pp. xv, 408. \$5.00.

The subtitle of this interesting work is "The Organismal Conception of Life." The author, who is the director of the Scripps Institution for Biological Research, University of California, is one of our foremost biologists, and excellently qualified for the discussion of fundamental life problems which he here undertakes. The book is avowedly an attack upon the more or less prevalent



view that plants and animals are mere aggregations of fundamentally independent elements. Whether these elements are considered as atoms, as simple chemical substances, or as living cells, they are insufficient to account for the unity of the organism as a whole. Part I is devoted to a critique of the elemental conception of the organism. The author reviews the history of "elementalism" from Empedocles to the present day, attacks the Weismann view of the continuity of the germ plasma, discusses the chemistry of the organism, contends that there is no universal formula for protoplasmic structure, that we should speak of protoplasts rather than protoplasm, reviews the cell theory of organism and its short-comings, examines the nature and mechanism of heredity, sifts the evidence for and against chromatin as the physical basis of heredity, and arrives at the conclusion that the materials of germ cells are merely the initiators and not the determiners of the traits of the developing organism. In Part II the broader implications of the organismal conception are developed, growth integration is described, the functions of the nervous system in integration are emphasized, the significance of psychical integration in higher animals and man is discussed, and the work closes with a sketch of an organismal theory of consciousness. It will be seen, therefore, that the book makes an appeal not only to the biologist but to the psychologist and to the reader of general interests. It must be carefully considered by every thoughtful student of life phenomena.

SAMUEL D. ROBBINS. *A Plethysmographic Study of Shock and Stammering*. Reprinted from *The American Journal of Physiology*, Vol. 48, 1919. Pp. 285-330.

This experiment was undertaken to test the theory that stammering is accompanied by congestion of blood in the brain. It shows that both stammering and shock are characterized by marked vasoconstriction in the periphery (hand), and, therefore, tends to confirm the view that there is a corresponding dilation and congestion of the blood vessels of the head.

GEORGIE J. RUGER. *Psychological Tests: A Bibliography*. Supplement to January 1, 1918. New York: Bureau of Educational Experiments, 1918. Pp. 79-III.

This is supplement I to Bulletin No. 6, which is an earlier bibliography of Psychological tests. The numbers in the present bibliography are chiefly from the year 1917.

PETER SANDIFORD, Editor. *Comparative Education*. New York: E. P. Dutton and Company, 1918. Pp. x, 500. \$4.00.

This interesting volume presents a comparative study of education in six representative countries of the world: The United States, Germany, France, Denmark, England and Canada. The collaborators in the work are Wm. F. Russell, Dean of the College of Education, State University of Iowa (United States); I. L. Kandel, Carnegie Foundation for the Advancement of Teaching (Germany); Arthur H. Hope, Headmaster of the Roan School for Boys, Greenwich, England (France); Harold W. Foght, United States Bureau of Education (Denmark); and the Editor, who is professor of education in the University of Toronto (England and Canada). From this array of educational specialists one expects and finds a clear, definite, comprehensive account of the main features of educational policy and procedure in the countries treated. It constitutes the most valuable survey of contemporary education to be found in a single volume.

JOHN THOMAS SIMPSON. *Hidden Treasures The Story of a Chore Boy who made the Old Farm Pay*. Philadelphia: J. B. Lippincott, 1919. Pp. 303.

A story of a boy who went from town to country and by inducing his uncle to adopt the methods of scientific farming started both the uncle and himself on the road to success. The tale is written with the purpose of portraying in attractive fashion the opportunities of life on the farm.



PARKE SCHOCH AND MURRAY GROSS. *Elements of Business*. Cincinnati: The American Book Company, 1918. Pp. 216.

There is an increasing demand for commercial training in high schools, and the fundamental principles of business are of importance for every intelligent boy or girl. The topics treated in this book are money and credit, banking, insurance, property, investments, letter writing, and personal account records. It is a stimulating and helpful little book.

J. B. SEARS. *Classroom Organization and Control*. Boston: Houghton Mifflin Company, 1918. Pp. xiii, 300. \$1.75.

"The book is divided into four parts. In Part I the problem of school management is set forth. The broad social aim and character of education and of the school as an institution are emphasized, and the essential relationship between a clear aim and any trustworthy plan of action is explained. In Part II the discussion centers about the pupil as the object of management, showing how the school is to help the child to develop a real sense of membership in the group. This brings up questions of attendance, order and discipline, punishments, and incentives, with constant emphasis upon what the school can do for the individual child. Part III describes the machinery necessary for managing children in groups, and explains the process by which such means may be made effective in achieving the principal educational aims. Part IV undertakes to sketch out and to point the way toward the attainment of a set of standards in personality, professional development, health, and methods of work, for the teacher as the instrument by means of which society hopes to attain its educational aims." The author makes frequent reference to the results of educational measurements. There is a bibliography of fifty-six titles.

C. E. SEASHORE. *Manual of Instructions and Interpretations for Measures of Musical Talent*. New York: Columbia Gramophone Company, 1919. Pp. 16.

A book of directions for the use of the Columbia Gramophone Records in testing the musical abilities of school pupils. It is to be used in connection with Professor Seashore's *Psychology of Musical Talent*, and presents distribution curves for pitch, intensity, time, consonance, and tonal memory.

UPTON SINCLAIR. *The Profits of Religion*. Pasadena, Cal.: Published by the author, 1918. Pp. 315. Paper, \$0.50.

The author states of this book "It is a study of Supernaturalism from a new point of view—as a source of income and a shield to privilege. I have searched the libraries through, and no one has done it before. If you read it you will see that it needed to be done." If the author "searched the libraries through," there is certainly little evidence of his search in the pages of this book. In the midst of much wild lashing out at the institution of property, there are here and there shrewd observations on the toadyism of the church and the complacent neivete with which church people accept and endorse social inequalities.

DANIEL STARCH. *A Scale for Measuring Handwriting*. Reprinted from *School and Society*, Vol. IX, 1919. Pp. 9.

A critical examination of the Thorndike and the Ayres handwriting scales is followed by the description of a new scale of handwriting. Six hundred and twenty-seven samples were secured from elementary schools, high schools and business colleges in which some one of the widely current methods of business writing was taught. From these 227 samples were selected as representative and were ranked by each of eleven judges. From these 88 samples were again selected as most representative of the entire series, and were ranked by each of 100 judges. A scale was then constructed with equal steps from 1 to 20, based on the P. E. values of each sample, according to the method pursued by Thorndike. Instead, however, of comparing each sample with the next poorest, each

was compared with each of the five next poorer samples. This, according to the author, gives the scale a much greater reliability than that of Thorndike.

WILLIAM A. STECHER. *The Theory and Practice of Educational Gymnastics*. Philadelphia: John J. McVey, 1918. Pp. 145. \$1.50.

This book is intended for use in Junior and Senior High Schools, and in boys' and girls' clubs. Part I sets forth the objects of physical training, the types of lessons, the aims of different groups of exercises, viewpoints underlying the selection of material for carrying out the different aims, and the principles of combining movements into free exercises. Part II gives the instruction material for three years' work in outline form and Part III presents assigned work arranged in the form of typical lessons. The book contains 33 illustrative figures, and promises to be a useful guide to teachers of educational gymnastics.

BERTHA STEVENS. *Private Commercial Schools of Manhattan and the Bronx*. New York: Public Education Association, 1918. Pp. 144.

This is the report of a committee to investigate private commercial schools in New York City. The survey found 67 such schools and grouped them into four types according to their equipment, teaching force and student body. Many of these schools are doing good work, but others offer their pupils little for their money. The committee recommends state registration and licensing, with state censorship of advertising materials used in soliciting pupils.

*Surveys in Mental Deviation in Prisons, Public Schools and Orphanages in California*. Sacramento: California State Board of Charities and Corrections, 1918. Pp. 87.

The monograph includes "A Partial Survey of the Prison Population of San Quentin, California, Based on Mental Tests of 155 Consecutive Entrants" by Lewis M. Terman and H. E. Knollin; "Backward and Feeble-Minded Children in the Public Schools of 'X' County, California," by Lewis M. Terman, Virgil Dickson and Lowry Howard; "The Intelligence of Orphan Children and Unwed Mothers in California Charitable Institutions," by J. Harold Williams; and "The Mental Examination of 75 Children at the 'Y' Home" by Grace M. Fernald. San Quentin shows a percentage of feeble-mindedness sixteen times as great as in the population at large. The average I. Q. of the orphans studied was 94, while that of the unwed mothers was 77.

C. W. SUTTON. *The Arithmetical Abilities of School Children as shown by Courtis Tests*. Cleveland: Division of Reference and Research, 1917. Pp. 15.

The report presents the results of the Courtis Tests given to grades IV to VIII in 36 schools. Cleveland is doing good work in the lower grades, but falls behind slightly in grades VII and VIII. The usual spread of abilities throughout the grades was noticed. Many fourth grade children surpass the median of the eighth grade, while many eighth grade children fall below the median of the fourth. The teacher is exhorted to watch the individuals of her class to see that the proper distribution of drill is given to bring each pupil up to a fair standard, but not to prolong this drill beyond a certain point for the brighter children.

LEWIS M. TERMAN. *Intelligence of School Children*. Boston: Houghton Mifflin Company, 1919. Pp. xxii, 317. \$1.75.

This is an indispensable book for teachers who desire to be informed regarding the application of the results of tests of intelligence to school conditions. It is a companion book to the author's *The Measurement of Intelligence*, and is intended as an introduction to it. Professor Cubberley, the editor of the series, says, "A careful study of this book by the teachers of a city or state would contribute wonderfully to the intelligent handling of children, and the study of it



by prospective teachers would open up entirely new conceptions as to educational procedure, and would lead to a far more satisfactory direction of the exceptional children found in every school. The book will also prove of much value to parents interested in the education of their children, and especially to those whose children vary much in either direction from the normal." Chapter one discusses the principles of intelligence testing and develops the significance of the I. Q. Chapters two to six deal with individual differences in school children, with especial reference to the kindergarten, the first grade, the fifth grade, and the first year of the high school. The topics of other chapters are "The Mental Age Standard for Grading," "Mental Tests of School Laggards," "The I. Q. as a Basis for Prediction," "Some Facts about Fifty-nine Superior Children," "Case Studies of Forty-one Superior Children," "Intelligence Tests in Vocational and Educational Guidance," and "Practical Suggestions for the Use of Mental Tests." The last topic in the book deals with the value of group tests for the preliminary survey of a class or school, supplemented by individual tests of special cases. This is undoubtedly the direction in which intelligence testing is moving, and this interesting and readable discussion of the subject will do much to speed its progress.

LEWIS M. TERMAN. *An Experiment in Infant Education. Introductory Statement.* Reprinted from the Journal of Applied Psychology, Vol. II, 1918, 219-228.

This is a most interesting account of the way in which a father taught his two year old girl to read. The experiment was begun when the child had reached the age of nineteen months. Noting that she took great interest in pictures, the father presented the capital letters as pictures, maintaining interest at a high point by artificial devices. At twenty-one months the child had advanced to word pictures and real reading began. In the next five months her reading vocabulary increased to over seven hundred words, and she had read more than four school primers. The crucial point about the whole process was keeping interested attention at a high level all the time. The experiment contains many suggestions for a modification of procedure in the kindergarten. There is no reason why bright children might not be taught the elements of the school arts in the form of play at a very early age.

LEWIS M. TERMAN. *Tests of General Intelligence.* Reprinted from the Psychological Bulletin, Vol. 15, 1918. Pp. 160-167.

A discussion of the fundamental principles underlying mental testing, the unreliability of ordinary judgments of intelligence, and the superiority of the test method.

LEWIS M. TERMAN. *The Use of Intelligence Tests in the Army.* Reprinted from the Psychological Bulletin, Vol. 15, 1918. Pp. 177-187.

Selections from a text book prepared for use in the Student Army Training Corps. Discusses the significance of mental tests for military purposes, outlines the three systems of tests used in the war, presents the rating scale, and gives the results with 100,000 men.

LEWIS M. TERMAN AND MRS. MARY B. CHAMBERLAIN. *Twenty-three Serial Tests of Intelligence and their Intercorrelations.* Reprinted from the Journal of Applied Psychology, Vol. 2, 1918, Pp. 341-354.

The twenty-three tests are described and the table of intercorrelations given. The highest average correlation was obtained by mental age, the lowest by finding the shortest road between two points.

W. W. THEISEN. *A Report on the Use of Some Standard Tests.* Madison, Wis.: State Department of Public Instruction, Studies in Educational Measurements in Wisconsin, Bulletin No. 1, 1918. Pp. 120.

This valuable monograph is full of suggestions for the utilization of standard educational tests in the work of the classroom. It contains studies in spelling,



arithmetic, writing, composition and reading. In spelling three groups of twenty-five words each taken from the Ayres scale were given to pupils in grades III to VIII in 35 cities, 132 graded schools, and 1173 rural schools. The Wisconsin children are from one-half to a full year behind the Ayres standards. It is greatly to be regretted that the distributions of spellings on individual words was not indicated. In arithmetic the Woody Tests, Series A, were given to over 7,000 pupils in grades III to VIII in 21 cities. There is a very interesting analysis of ten troublesome examples. In handwriting the relation of speed and quality was examined on the basis of the Thorndike scale, compositions were scored by the Hillegas scale, and reading was evaluated by the Kansas Silent Reading Tests. Each chapter closes with a list of selected references on measurements in that field and on methods of teaching the subject.

L. L. THURSTONE. *The Anticipatory Aspect of Consciousness*. Reprinted from the Journal of Philosophy, Psychology and Scientific Methods, Vol. 16, 1919, Pp. 561-568.

An analysis of concepts in terms of unfinished acts. "The concept and the idea are differentiated by the fact that the concept is the ideomotor antecedent of the idea, and that the transition involves the process of making the concept stage of the circuit sufficiently particularized to be personally concrete."

L. L. THURSTONE. *The Learning Curve Equation*. Psychological Monographs, No. 114, 1919. Pp. 51. \$0.75.

This is an account of the derivation and application of various mathematical formulae to the learning process as exemplified typewriting practice.

HERBERT A. TOOPS AND RUDOLF PINTNER. *Variability of the Education of Unemployed men*. Reprinted from the Journal of Applied Psychology, Vol. II, 1918. Pp. 207-218.

The median school grade of over 16,000 men applying for employment at the Dayton State-City Free Employment Office during the years 1916-1917 was approximately 8.30, or slightly above the eighth grade. The range extended from those with no schooling whatever to college graduates. The article gives extended tables of distribution by months and by seasons.

C. W. VALENTINE. *The Experimental Psychology of Beauty*. Edinburgh: Thomas Nelson and Sons, 1919. Pp. 128. 1 s. 3d.

A valuable summary of British experiments in the psychology of color, form, symmetry, pictorial appreciation, musical intervals and rhythm. The experiments of Miss Puffer are the only American investigations referred to, and curiously enough no mention is made of Seashore's extensive studies in music.

MARVIN J. VAN WAGENEN. *An Investigation into the Amount of Improvement in Ability to Write English Composition*. Bulletin of the University of Minnesota, Vol. 22, No. 5, 1919. Pp. 18.

This bulletin reports the attempt to measure the improvement in English Composition as a result of 12 weeks' practice in regular high school composition work. Four sets of twelve topics each were compiled and sent to the members of the Minnesota English Teachers' Association. Nearly 100 teachers cooperated in the experiment, and the compositions were graded by the Harvard-Newton scales and checked by the Thorndike extension of the Hillegas scale. Detailed tables of scores are given. The net result of the experiment was that "the amount of gain to be derived from 12 weeks' practice in theme writing is very small, too small to be measured with any degree of accuracy from the numbers taking part in this investigation."

J. E. WALLACE WALLIN. *The Value of the Intelligence Quotient for Individual Diagnosis*. Reprinted from the *Journal of Delinquency*, Vol 4, 1919. Pp. 109-124.

A historical and critical consideration of the I. Q. and a discussion of its validity on the basis of the study of 411 cases in St. Louis. The author contends that the I. Q. tends to diminish with chronological age, and that, therefore, it means different things at different ages. Thus the I. Q. exaggerates the mental retardation of youths and adults as compared with children. Follow-up studies of adolescent cases support the view that individuals rated as imbecile by the I. Q. are able to support themselves in society, and should not be rated lower than backward.

HOWARD C. WARREN. *Human Psychology*. Boston: Houghton Mifflin Company, 1919. Pp. xx, 460. \$2.75.

This book is packed full of good things. In breadth of view, in sanity of balance, in the inclusion and proper evaluation of biological, neurological and purely mental factors, in the choice of illustrative diagrams, in clearness of statement, and in sympathetic interpretation of the higher thought processes it represents a distinct advance over previous texts. The author's general point of view is behavioristic, without excluding the conscious responses which play such an important role in our adjustments to life situations. He defines psychology as "the science which deals with the mutual interrelation between an organism and its environment." Recognizing, therefore, that physical structure is an essential feature of this interrelation, he does not refer the student to physiology and neurology for the study of this structure, but proceeds at once to a clear and concise description of the elements of organic structure. The conception of the nervous arc is well worked out, and the neurological terms of receptors, connectors and effectors are freely and consistently used. There is an excellent brief discussion of reflexes, and while instincts are said to depend on inherited structure, it is recognized that they are the result of integration and co-ordination of nerve impulses, and that human beings have practically no pure instinctive activities unmodified by habit formation. While the educational psychologist will find the learning process treated too briefly, and the general patterns of conscious response perhaps too broadly, the teacher of general introductory psychology with college classes will welcome the book as a discriminating selection of the essential results of modern psychological investigation.

HANOR A. WEBB. *Chemistry, A Trade or a Profession?* Reprinted from the *Scientific Monthly*, December, 1918. Pp. 530-534.

The high school graduate who has specialized in chemistry and who desires to go into industry finds that he has not had enough training to be called a chemist, nor enough experience to command any advantage as a workman. There is little encouragement, therefore, to try to make high school chemistry articulate with industry.

CARL J. WEST. *Introduction to Mathematical Statistics*. Columbus: R. G. Adams and Company, 1918. Pp. 150.

This book is designed for those who have no further knowledge of mathematics than elementary arithmetic, and presents in simple, lucid fashion the theory of statistics. It deals with curve plotting, frequency curves, averages, forms of distribution, the normal probability curve, correlation tables and ratios, rank correlation, coefficient of correlation, moments of a distribution, and the method of contingency. The book is printed on heavy glazed paper, and is well gotten up.

## THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

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### The Administration of the Psychology Prerequisite to Courses in Education

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#### I. INTRODUCTION

TO an instructor in a college or university, or to one charged with the administration of courses in such institutions, in all probability no problem is of more vital concern than that of prerequisites. The instructor has a two-fold interest in that he wishes on the one hand to safeguard his courses from those students who are too ill-prepared and too inexperienced to profit by them and on the other hand he does not desire his courses to be hedged about with such a relay of prerequisites that they are closed to the vast majority of students who might otherwise be eligible to enter them. The administrator, such as a head of a department, dean of a college or director of a school, no doubt has the same interests as the instructor directly in charge of the courses, but he has the additional interest of wishing to develop his department or college or school in what he considers the most efficient and meritorious manner of accomplishing the ends for which his particular unit exists. He does not wish the development of his unit to be hampered by prerequisites, no matter how desirable they may seem to be, if they interfere with the administration of the courses under his charge. As a rule he, like the instructor, is not opposed to prerequisites as such, for they must exist both within a department and among departments, but he is opposed to those for which he is evidently in no way responsible and which cannot be administered with justice to all—administrator, instructor and student. The interest in this problem of prerequisites is not limited to any single instructor, nor to the administrator of any single department or



college or school within any single college or university, but is manifest in all institutions of higher learning.

The present study is an attempt to determine the current practices within the leading state universities and colleges in this country concerning psychology as a prerequisite to courses in education. During the latter part of May, 1918, questionnaires were sent to those directing the courses in education in most all State universities and colleges as listed in United States Bureau of Education Bulletin No. 6, 1916 (Statistics of State Universities and State Colleges). Similar questionnaires were sent to Leland Stanford, Syracuse, Chicago and Columbia. From the 88 questionnaires sent out 44 usable replies were received. Several other institutions replied but stated that no such courses were offered or that the institutions concerned were not typical.

In tabulating the data, these institutions were divided into five distinct groups. Group I, consisting of 12 large State universities, each having over 2,000 students enrolled, as shown by the United States Bureau of Education Bulletin No. 6, and not classified as mainly technical or agricultural, includes such universities as California, Ohio, Illinois, Wisconsin, Minnesota, Iowa, Michigan, Indiana, Washington, etc. Group II, consisting of 16 similar institutions, but having less than 2,000 students each, includes such universities as Montana, Oklahoma, Colorado, Maine, Idaho, North Dakota, Tennessee, South Carolina, etc. Group III, consisting of 11 State technical or agricultural institutions, includes Iowa State College, Kansas State College, Michigan Agricultural College, Purdue University, Oregon State College of Agriculture, Agricultural and Mechanical College of Texas, etc. Group IV consists of the State Teachers Colleges of Colorado and New York. Group V consists of three private institutions, Leland Stanford, Syracuse University, and Teachers College, Columbia University.

The results as gathered from these data will be presented under the following heads:

1. Administrative Control of Courses in Psychology and Education.
2. Psychology as a Prerequisite to Courses in Education.
3. Current Practices in the Administration of the Psychology Prerequisite.
4. Nature of the Psychology Satisfying the Requirement.

## II. RESULTS

### A. ADMINISTRATION CONTROL OF COURSES IN PSYCHOLOGY AND EDUCATION

#### I. *Departmental Control*

If one is to understand thoroughly the relation of courses in psychology to those in education he must understand the departmental control of such courses. In Table I almost the whole history of the development of departmental control of courses in education is made manifest. It shows that at the present time in

TABLE I  
DEPARTMENTAL CONTROL OF COURSES IN PSYCHOLOGY AND EDUCATION

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
Total number reporting, .....	11	16	9	2	3	41
In independent departments, .....	9	6	2	1	2	20
In department of psychology, .....			1			1
In department of philosophy, .....	2	5*	1			8
In combined department of psychology and education, .....		5	5	1	1	12

\*Note: The Universities of Colorado and North Dakota are included under the jurisdiction of the department of philosophy. However, it should be stated that such jurisdiction was indicated as not confined exclusively to this department.

20 of the 41 institutions the courses in education and psychology are given in independent departments. This tendency is most pronounced in the institutions in Group I (the larger State universities), but it is quite distinct in Group II (the smaller State universities). In Group III (the technical and agricultural institutions) and to a considerable degree in Group II the jurisdiction of the courses rests in a department designated as the department of psychology and education. Since this tendency is most marked in the smaller and the technical or agricultural institutions, one can rest fairly well assured that it is due to small offering of courses in these subjects. It is interesting that 8 institutions have the courses in psychology and education under the jurisdiction of the philosophy department. This is a remnant of an earlier period in university development when philosophy held full sway and when psychology as well as education was considered unworthy of much respect. It is rather surprising to see that only a single institution reports courses in education under the jurisdiction of the department of psychology.

One would rather expect to find such jurisdiction in the smaller colleges and universities where psychology was earlier established and where institutional growth has been hampered, but apparently this is not the case. One must conclude from these facts that as a rule courses in education tend to be controlled by an independent department, which is on a par with other departments and tends to develop unhindered along lines of its own desires.

## 2. Faculty Control

The independence of the departments of education is magnified when one notes that the department itself usually determines what the prerequisites to its courses shall be. Table II shows that the Department of Education in 29 out of the 44 institutions reporting, determines its own prerequisites. In 3 institutions of Group I and 7 institutions of Group II the general faculty exercise the prerogative of determining the prerequisites. However, it probably happens in these cases, as was indicated by one of the smaller State

TABLE II  
AGENCIES DETERMINING PREREQUISITES TO COURSES IN EDUCATION

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, . . . . .	12	16	11	2	3	44
Department of education, . . . . .	9*	6.	10§	2	2	29
Departments of education and psychology, ..	0	2†	1	0	1	4
Faculty of college or university, . . . . .	3	7‡	0	0	0	10
Instructor giving course, . . . . .	0	1	0	0	0	1

Notes:

\*One replied, "instructor, department and dean have complete control."

†One replied, "departments of education and psychology with consent of instructor."

‡One replied, "on recommendation of the department of education."

§One replied, "department of education, but must be passed upon by faculty."

institutions, that the general faculty merely passes upon the recommendations of the department of education. It is quite interesting to note in passing that only 1 institution reports that the instructor giving the course has the power to determine the prerequisites and but 2 others mention the fact that the instructor is consulted. Such a condition, so far as this investigation is concerned, merely emphasizes the fact that the prerequisites for courses in education are determined by the department itself and not by the caprice of the individual instructor or of the general faculty.



# B. PSYCHOLOGY AS A PREREQUISITE TO COURSES IN EDUCATION

In many educational institutions the department of education is serving two distinct classes of students, those who are working for teacher's certificate or diploma, and those who are working for the undergraduate degree in education. Often times the administration of prerequisites is different in case of these two classes of students, and the facts concerning them are presented in separate sections.

## 1. *Psychology as a Prerequisite to the Teacher's Certificate*

From Table III it is firmly established that in current practice psychology is considered an essential part of the teacher's training

TABLE III  
PSYCHOLOGY AS A PREREQUISITE TO THE TEACHER'S DIPLOMA

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
Psychology as a prerequisite, .....	10	15	10	2	2	39
Psychology not a prerequisite, .....	2	1	1		1	5

for it is made a prerequisite to the teacher's diploma in 39 of the 44 institutions reporting. However, it is interesting to relate that three of the larger institutions in this country (Universities of Indiana and Texas in Group I and Leland Stanford University in Group V) do not make it a prerequisite. Yet it should be added that both the University of Indiana and University of Texas recommend and urge all prospective teachers to take courses in psychology.

The importance of psychology as an essential part of a teacher's training is emphasized by the fact that 35 of the 42 institutions reporting on this question say that psychology is considered a part of the regular professional training, but it must be added that this pronounced tendency is due to the preponderance of the smaller institutions. Of the 15 larger institutions of Groups I and V, 6 say that psychology is not considered a part of the professional training and if taken shall be taken in addition to the professional work. Such facts undoubtedly should not be interpreted as minimizing the value of psychology, but rather as magnifying and emphasizing the need of professional training.

While the practice of requiring psychology as a prerequisite to the granting of the teacher's diploma is well established, it would be erroneous to conclude that psychology is a prerequisite to all courses in education. Table IV shows 20 of the 44 institutions plainly state that it is *not a prerequisite to all courses in education*.

TABLE IV  
PSYCHOLOGY AS A PREREQUISITE TO COURSES IN EDUCATION

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
Prerequisite to all courses, .....	6	11	4	2	1	24
Not prerequisite to all courses, .....	6	5	7		2	20
Prerequisite to particular courses, .....	5	4	4		2	15
Not prerequisite to any course, .....	1	1				2

Note: Lower part of table refers to 20 institutions not making psychology prerequisite to all courses.

Of these 20 institutions, 15 report that it is a prerequisite to particular courses only, 2 that it is not required at all, while 3 did not indicate detailed practice. Of the 15 largest and best-developed institutions of Groups I and V, 8 do not make it prerequisite to all courses. This is probably due to the fact that in the larger universities more varied and differentiated courses in education are offered and close connection between some of the courses and psychology is not manifest. This conclusion is strengthened when one recalls that the prerequisites to courses in education are as a rule determined by those in charge of the departments of education, who, no doubt, have made such determinations only after a thorough analysis of the different courses and their bearing upon other related courses.

It is not surprising to find that 11 of the 16 smaller State universities require psychology as a prerequisite to all courses in education, but it is rather striking that 7 of the 11 agricultural and technical institutions do not make such a requirement. It may be that the latter institutions, often having scant offerings in both psychology and education and having a large number of students to be accommodated, make no such requirement because it is impossible to administer a rigid system of prerequisites, or it may be that in some of these large institutions, as in the large institutions of Groups I and V, some of the courses in education tend to have no direct relation to psychology. While it seems that there is no

pronounced tendency towards requiring psychology as a prerequisite to all courses in education, it should be pointed out that there is universal agreement as to its value. Such an agreement is evidenced by the fact that 14 of the 17 institutions requiring psychology as a prerequisite to *particular courses only* strongly urge all students to take it.

The amount of psychology required for meeting the prerequisite as shown in Table V, varies from 2 to 10 semester hours (hour meaning 1 recitation daily for 18 weeks) but the usual amount is from 3 to 6 hours. Such practices probably mean that the course in psychology is given 3 days per week and is required for either 1 or 2 semesters.

The table reveals nothing striking, unless it is the slight tendency for the larger institutions to require a smaller number of hours, a tendency which might easily be explained by the intensive and highly-specialized courses given in the departments of education in such institutions.

## 2. Psychology as a Prerequisite to an Undergraduate Degree in Education<sup>1</sup>

A few decades ago courses in education were unknown and nothing gives evidence of their growth so much as a consideration of the number of institutions which are now offering degrees in that subject. One is surprised to note in Table IV that 34 of the 44 institutions grant undergraduate degrees in education. It is especially surprising to find this practice in the agricultural and technical institutions, where 9 of the 11 such institutions report the

<sup>1</sup>Note: The question was asked concerning the amount of psychology in addition to the prerequisite required for an advanced degree in education. As we should expect, many of the institutions do not give such degrees, and among those which do there is no uniformity of practice. No correlation exists between the amount of the original prerequisite and the amount of additional hours required. There is a manifest tendency among the larger institutions to base the amount required upon the selection of the minor. The tabulated results of the 23 institutions reporting such degrees are as follows:

Number of Additional Hours	Institutions Reporting
0	5
2-3	5
4-5	1
6-7	5
8 or over	2
depending on minor	5



TABLE V  
SEMESTER HOURS OF PSYCHOLOGY REQUIRED FOR PREREQUISITE

	GROUPS					Total
	I	II	III	IV	V	
Number of hours—0, .....	2	1	1		1	5
" " " 2, .....	2					2
" " " 3, .....	3	5	3		2	13
" " " 4, .....		2	2			4
" " " 5, .....	1	1				2
" " " 6, .....	4	6	3			13
" " " 7, .....						
" " " 8, .....		1	1			2
" " " 10, .....			1			1
Institutions reporting, .....	12	16	11		2	42*

\*Note: Reports from the 2 institutions in Class IV were not usable for this item.

TABLE VI  
PSYCHOLOGY AS A PREREQUISITE TO AN UNDERGRADUATE DEGREE IN EDUCATION

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
Number granting degrees, .....	8	13	9	2	2	34
Number with prerequisite, .....	6	13	8	2	2	31
Number without prerequisite, .....	2					2*

\*Note: One institution granting a degree failed to make reply concerning the prerequisite.

granting of degrees in education. It is likewise worthy of mention that 4 institutions in Group I, (California, Cornell, Michigan and Wisconsin) offer no undergraduate degrees in education.

Of the 34 institutions granting degrees in education, 31 require psychology as a prerequisite. The amount required as a prerequisite for a degree is usually the same as is required for the teacher's diploma. In an instance or two psychology is not required for the diploma and is required for the degree. Leland Stanford is a good illustration, requiring no psychology for the teacher's diploma, but 10 hours for the degree in education. In 23 of the 34 universities giving undergraduate degrees in education no more psychology than the original prerequisite is required. In the remaining 12 universities requiring more psychology, the additional amount required varies from 3 to 10 hours, but is usually either 3 or 6 hours. All this means that most of the work given for the degree in education is given within the education department itself. Table VII showing the number of hours of psychology required for securing the degree makes this point doubly clear. It shows

TABLE VII  
DISTRIBUTION OF INSTITUTIONS SHOWING THE NUMBER OF SEMESTER HOURS  
IN PSYCHOLOGY REQUIRED FOR A DEGREE IN EDUCATION

		GROUPS					Total
Semester	Hours	I	II	III	IV	V	
"	0,	2					2
"	2,	1					1
"	3,	1	1	3		1	6
"	4,		1				1
"	5,	1		1			2
"	6,	2	4	2			8
"	7,		1	1			2
"	8,		3		1		4
"	9,		2				2
"	10,			1		1	2
"	11,			1			1
"	12,	1					1
Total,		8	13	9	1*	2	32

\*Note: One institution in Class IV reported in an unusable form

that 20 of the 32 institutions reporting do not require more than 6 hours of psychology for the degree. Some of the outstanding exceptions to this tendency are the University of Minnesota (Group I) requiring 12 hours, University of Colorado (Group II) requiring 11 hours, Leland Stanford University (Group V) requiring 10 hours. However, requiring so much psychology for the degree in education is not the rule. It should be said in this connection that only 3 of the institutions offering degrees will allow the substitution of work in psychology for work in education. Of these 3 institutions, 2 will allow a substitution of only 3 hours, and 1 from 4 to 8 hours.

When asked if the time for taking the courses meeting the psychology requirement is the same in case of those working for the teacher's diploma and for those working for the degree, 25 institutions replied in the affirmative, 9 offer no degree, 5 said the practice is different and 5 failed to reply. Of these 5 institutions saying the practice is different 1 indicated that those working for the teacher's diploma meet the requirement in the freshman year, while those working for a degree in education meet it in the junior year. Another stated that in case of those working for a degree the requirements are more rigidly enforced. While it must be admitted that a few irregularities exist, from the facts in the last 2 sections, it must be concluded that the administration of the psychology requirement is about the same, regardless of whether one is working for the teacher's diploma or for a degree in education.

### C. CURRENT PRACTICES IN THE ADMINISTRATION OF THE PREREQUISITE OF PSYCHOLOGY

According to a current slogan there is a great difference between theory and practice. It is reasonably clear that the psychology prerequisite is accepted in theory but that it is not lived up to in practice. The cause of the failure to enforce the prerequisite may lie in its application to special cases, but the fact remains that it is *flexibly and not rigidly administered*. There is much evidence to substantiate this assertion.

#### 1. Possible Sequences of Courses

The first evidence of conflict between theory and practice is manifest in Table VIII. The upper part of this table is carried

TABLE VIII  
CURRENT PRACTICES IN ADMINISTERING THE PSYCHOLOGY PREREQUISITE  
TO COURSES IN EDUCATION

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
Stating psychology prerequisite to all education, .....	6	11	4	2	1	24
Requiring completion of psychology before taking education, .....	3	2	1	1	2	9
Not requiring completion of psychology before taking education, .....	9	14	10	1	1	35
Permitting taking courses simultaneously, ...	9	14	10	1	1	35
Not satisfied with taking psychology at any time before graduation, .....	9	9	10	2	3	33

forward from Table IV where the returns were presented to the question, "Is psychology a prerequisite to all courses in education?" It shows that 24 institutions reported in the affirmative, yet the lower part of the table reveals that but 9 of the 24 institutions so reporting require that psychology be completed before courses in education are taken. This means that the 15 remaining institutions make exceptions in the administration of the prerequisite, even though in theory they are not supposed to do so. If one should combine with these 15 institutions, the 20 institutions which do not require psychology as a prerequisite to all courses in education, it seems that 35 of the 44 institutions would not require the completion of the psychology prerequisite before work in education is taken. All 35 of the institutions say that they are willing



that courses in psychology and education be taken simultaneously—a condition which might furnish some sanction for the practice.

Even though Table VIII shows a willingness to compromise in the administration of the psychology prerequisite, one feels that this tendency is caused in many instances by the exceptional cases and represents a variation from the regular practice. The nature of some of the questions asked e. g., "would it be possible for a student to take a required course in education and the course in psychology at the same time?" tends to center attention on the special rather than the ordinary case, but in no other way could the actual practice be ascertained. The results so obtained indicate that the cause of the compromise lies in the fact that a rigid system of prerequisites cannot be universally administered with justice to all concerned. Even though 35 institutions would allow a student to take courses in education without completing his work in psychology, 33 of them said it would *not be satisfactory* for the student to finish his psychology at *anytime before graduation*. This simply means that the institutions show some leniency in the administration of the prerequisite but they expect the work finished as soon as possible.

In connection with the time for finishing the psychology prerequisite it might be well to add that Table IX shows the most common practice is to begin courses in education in the junior year.

TABLE IX  
COLLEGE YEAR COURSES IN EDUCATION ARE BEGUN

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
Freshmen year, .....	3	5	3	1		12
Sophomore year, .....	2	5	2			9
Junior year, .....	7	5	6	1	3	22
Senior year, .....		1				1

The next most common practice is to begin them in the freshman year. At first thought it might seem that in those 24 institutions which make psychology a prerequisite to all education, the courses in education would not begin until the junior year, but this is not necessarily true. Of such institutions, 12 begin courses in education in the junior year, 7 in the freshman year, 4 in the sophomore year, and 1 in the senior year. So it seems that the prerequisite has little to do with the time of beginning courses in

education, but the fact that such courses are begun so early in some institutions, undoubtedly complicates the administration of the psychology prerequisite.

2. *Administration of the Prerequisite for Students in Other Departments not Working for Teacher's Certificate or Degree in Education.*

Additional evidence that the psychology prerequisite is not rigidly enforced is gleaned from the treatment of those from other departments who desire to elect certain courses in education, but who are not interested in the teacher's diploma or in the degree of education. These students have not met the psychology prerequisite and if they meet it, it is impossible at this time or later to elect the desired courses. Under such conditions what should those in charge of administering the prerequisite do? Table X shows how it would be administered in the institutions under consideration. While this table shows several facts we are especially interested in making comparison of the number of institutions stating that psychology is a prerequisite to all courses in education and the number who refuse admittance to the above mentioned students because they have not met the prerequisite. It is significant that 24 of the institutions make the blanket statement that psychology is a prerequisite to all courses in education, yet only 11 would not allow such students to elect the desired courses. These figures deal with admitting such students to courses in education in general, but even greater liberality is shown in dealing with certain specific courses. Only 9 institutions would refuse to admit a law student who had not met the psychology requirement into a course in educational sociology, and only 4 institutions would refuse to admit a major in history who had not met the psychology requirement into a course in the history of education, even though 24 institutions say such a requirement is a prerequisite to all courses in education.

D. NATURE OF THE PSYCHOLOGY SATISFYING THE PREREQUISITE

Any attempt to summarize the nature of the courses in psychology which satisfactorily meet the prerequisite is apt to be misleading. In the original questionnaire four typical courses were listed and the different institutions were asked to add any others that might be needed and to check the ones which satisfied the

TABLE X

ADMINISTERING THE PSYCHOLOGY PREREQUISITE IN CASE OF STUDENTS IN OTHER DEPARTMENTS NOT WORKING FOR DIPLOMA OR DEGREE

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
Number stating psychology as a prerequisite to all education, .....	6	11	4	2	1	24
Admitting such students without prerequisite, .....	8	11	6	0	1	26
Not admitting such students without prerequisite, .....	4	3	2	1	1	11
Not answering, .....	0	2	3	1	1	7
Admitting law student to educational sociology without prerequisite, .....	7	9	5	1	2	24
Not admitting law student to educational sociology without prerequisite, .....	3	3	2	0	1	9
Not answering or not giving course, .....	2	4	4	1	0	11
Admitting major in history to history of education without prerequisite, .....	7	15	8	1	1	32
Not admitting major in history to history of education without prerequisite, .....	3	0	0	0	1	4
Not answering or not giving course, .....	2	1	3	1	1	8

prerequisite. It happens that no additional courses were added, which fact might at first suggest a certain uniformity of practice. But such is far from the true situation as evidenced by the following list of courses or combination of courses satisfying the prerequisite: In 9 institutions, general psychology and educational psychology; in 2 institutions, general psychology or educational psychology; in 4 institutions, general psychology, and either modified course in general psychology, educational psychology or experimental psychology; in 2 institutions, general psychology and experimental psychology; in 8 institutions, general psychology modified to meet the needs of education; in 5 institutions, educational psychology; in 2 institutions educational psychology or general psychology modified to meet the needs of education; in 2 institutions, a choice of either educational psychology or modified general psychology, etc. All told 14 different combinations exist for meeting the requirement.

Table XI is an attempt to summarize the total number of times each course was mentioned in connection with meeting the prerequisite. In the construction of this table, each time the course was mentioned it was recorded, no matter whether it alone would meet the requirement, or whether it was one of two courses, or was an alternate course. From this table it seems that general



TABLE XI  
NATURE OF PSYCHOLOGY MEETING PREREQUISITE

	GROUPS					Total
	I	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
General psychology with little emphasis on application, .....	8	11	4	0	2	25
General psychology modified to meet the needs of education, .....	3	5	5	1	1	15
Special course in educational psychology, .....	6	9	5	2	2	24
Experimental psychology, .....	3	2	0	0	1	7

psychology with little or no emphasis on application is the course most frequently mentioned. Educational psychology is next. Educational psychology gains its place by being constantly associated with other courses. As pointed out above only 5 institutions accept this course in itself as meeting the requirement, but 4 institutions make it an alternate. While the course in general psychology modified to meet the needs of education is mentioned only 15 times, it should be recalled that it was second to general psychology as the sole course meeting the prerequisite requirement.

When it is remembered that the number of semester hours necessary to meet the prerequisite varies from 2 to 12, it is easy to see that the number of courses required must also vary. This fact no doubt is responsible for the apparent chaos which exists in meeting the prerequisite. However, out of it all one can feel safe in saying that general psychology with little or no emphasis on application is quite generally emphasized, especially in Groups I and II. This tendency is not noticed in Group III, in fact there is some indication that educational psychology is here emphasized.

The rather inconsistent use of educational psychology as a prerequisite to courses in education can be explained partly if the departmental jurisdiction of the course is set forth. Table XII shows

TABLE XII  
DEPARTMENTAL JURISDICTION OF COURSES IN EDUCATIONAL PSYCHOLOGY

	GROUPS					Total
	I*	II	III	IV	V	
Number of institutions, .....	12	16	11	2	3	44
In department of psychology, .....	1	5	1		1	8
In department of education, .....	10	4	7	2	2	25
In both departments, psychology and education, .....	1	7	2			10
In department of psychology and sociology, .....			1			1

that usually the department of education gives the course in educational psychology. This is especially true in Groups I and III. In 10 institutions courses in educational psychology are given in both the education department and the psychology department. In 8 institutions such courses are given exclusively in the psychology department. With the above facts in mind it is reasonable to expect that the position of educational psychology as a prerequisite to courses in education will vary. If it is given in the psychology department and called psychology, then it can serve as a prerequisite to courses in education, but if it is given in the department of education, then it will naturally be a part of the courses in education, and can not serve as a prerequisite. Thus the jurisdiction of the courses becomes a potent factor in the determination of the prerequisite.

### III. SUMMARY AND CONCLUSIONS

From the present investigation the following facts and conclusions are evident:

1. The current practice especially in the larger institutions is for courses in education and psychology to be controlled in independent departments. The next most prevalent practice is for the courses to be under joint jurisdiction of the department of psychology and education.

2. In the large majority of the institutions the department of education itself determine its own prerequisites. In a few cases the general faculty of the college or university has some control, but such control usually consists in passing upon the recommendations of the department of education. In a few cases the instructors directly in charge of the courses are wholly or partly responsible for the determination of the prerequisites, but as a rule the staff of the department as a body has this power. As the department of education is most vitally concerned with the prerequisites and is responsible for their administration, it seems to be a wise and just policy to allow this department the power of determining these prerequisites.

3. In almost all institutions, in fact about 39 out of 44, psychology is required for the teacher's diploma, and in a vast majority of cases is considered as a part of teacher's professional training. In 24 institutions psychology is supposed to be a pre-

requisite to all courses in education, but 20 institutions state plainly that it is not. In 15 of these 20 institutions it is a *prerequisite to particular courses only*. This last-named tendency is noted especially in the larger institutions where no doubt the departments are offering a variety of widely differentiated courses, some of which are only most remotely related to psychology. As departments of education grow and develop, more and more situations will exist similar to those existing in some of the larger institutions, and as this development takes place, dissatisfaction with a blanket system of prerequisites is sure to arise. A final solution will probably spring from a thorough analysis of the content of all courses in relation to psychology and from a determination of the prerequisites to the different courses according to their actual dependence on psychology as set forth by these analysis. This solution will recognize the value of psychology as an integral part of a teacher's training—evidenced by the fact that almost all institutions now so regard it—but will make the subject prerequisite only to those courses actually based upon it and will allow students to enter other courses without having had it, such practice now exists in 15 of the institutions reporting.

4. Even though psychology is accepted in theory as a prerequisite to courses in education in 24 of the 44 institutions reporting, each of these 24 institutions, save 9, said it would be possible for a student to take some courses in education before completing the work in psychology. These same institutions would approve taking courses in education and psychology simultaneously, and thus suggest some liberality in the interpretation of the term "prerequisite." It may be that such liberality represents the exceptional practice rather than the rule, but the fact remains that the administration of the prerequisite is flexible and not rigid. Since in the institutions under consideration the prerequisites to courses in education are usually determined by the departments of education, it can safely be assumed that attempts have been made to enforce them, and that failure to do so has resulted from the inability to administer a blanket prerequisite.

5. Additional evidence of the liberality in the enforcement of the psychology prerequisite is reflected in the treatment of those students who are not interested in the teacher's diploma or in the degree in education, but who desire to elect courses in education without having had the required psychology. Only a very small



number of these institutions would prohibit the student from electing the desired courses. Only 9 out of 33 institutions reporting would prohibit a law student, who has not had psychology from taking a course in educational sociology and only 4 institutions out of 36 would prohibit a student with a major in history who had not met the psychology requirement, from taking a course in history of education. Such practices as above mentioned seem rational and just for the relationship between psychology and certain courses, e. g. history of education and educational sociology—is not very marked, and no student will be greatly handicapped in carrying either course without psychology. Furthermore, education as a subject of study is no longer confined to the professional needs of the teacher, but has certain practical and even cultural values which are important, in the civic life of future citizens, no matter what profession or walk of life, and the simple fact of a psychology prerequisite should not hinder the pursuit of such courses.

6. Current practices in the amount and the nature of the courses satisfying the psychology prerequisite reveal chaotic and unsettled conditions. The amount of psychology required varies from 2 to 12 hours, and consequently there is a great variation in the nature of the courses which satisfy the requirement. The course most often designated as meeting the requirement wholly or in part is general psychology with little or no emphasis on application. Educational psychology is listed both as a course in psychology and as a course in education. Part of the time it meets the requirement but more often it forms only a portion of the requirement, being supplemented by various courses or combination of courses. The chaos existing in the number of hours of psychology required for meeting the prerequisite and the great variety of courses indicated as satisfactorily meeting this requirement suggests a need for definite standardization in the prerequisite. It would seem also as important to have standardization in institutions of higher learning, especially the State institutions, as it is to have standardization in the secondary schools. What greater service could the society of college teachers of education perform than to make a definite study of this problem and to formulate its findings in the form of a definite set of recommendations. Such a set of recommendations it is true could be suggestive only, but it would no doubt aid in the standardization of the prerequisite and thereby promote development in departments of education at large.

# The Use of Tests in the Evaluation of Methods of Instruction

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Results of Investigations at the Johns Hopkins University Summer School.

THE fundamental purpose underlying the origination and development of educational measurements was their use for the improvement of instruction. We seem scarcely to have passed from the first stage of developing a measure that may be considered standard, and certainly have gone but a little way beyond the evaluation of the status of system, class, or individual, in comparison with the obtained standard.

We believe the most effective use of measurements is in the determination of methods of instruction, meaning neither specific devices and forms of procedure, nor grouping according to intelligence ratings, but an elasticity of program that will make possible the adjustment to individual needs of drill, assignments, forms of recitation and groupings of activities.

The pupils in the five grades, 4th to 8th inclusive, of the Demonstration School of the Johns Hopkins University Summer Course for 1918 were children who had failed of promotion because of deficiency in one or more fundamental subjects. There were two exceptions—children who had not failed but wished to attend the summer session. These deficiencies were usually marked arithmetic or English, the latter including reading, spelling, composition and grammar.

From this composition we would expect the distribution curves for standardized tests in these subjects to be skewed toward the lower end.

Standard tests were given to these pupils by the students in the university course of experimental education, under direct supervision of the instructor. Records as to age and deficiencies were taken from the cards sent out by individual instructors in the various schools of the city from which the pupils were drawn. Each of the teachers of these five classes was asked during the

last week to rate her pupils in accordance with a judgment scale worked out by the Psychological Survey of New York. We will consider the records of these scores and ratings as a basis for determining methodology of instruction.

The following tests were used: The Cleveland Survey Arithmetic Tests; Woody Arithmetic Scales—Subtraction and Division, Series A; Stone Reasoning Tests; Starch Grammar Tests including only Parts of Speech, Nouns and Pronouns, Punctuation Scale and Grammatical Scale; Kansas Silent Reading Tests; Boston Copying Tests; Psychological Survey Judgment Scale.

The question of over-ageness contributes little to the causative factors. Table I shows the distribution of deficiencies according to the age and grade of the pupils. Numbers in the columns designated by curriculum subjects represent the frequency of deficiencies in those subjects. In the 7th grade there was one pupil fifteen years old and one sixteen years old, both marked "deficient" in arithmetic. In the 8th grade there was one pupil sixteen and one seventeen years old. The latter was a cripple and had an Intelligence Quotient of 80.2, determined by the Stanford Revision of the Binet-Simon Scale. The mode for each grade falls at the expected age.

Approximately, 60 per cent. of the pupils in the 4th, 6th and 8th grades; 75 per cent. of the 5th grade; and  $16\frac{2}{3}$  per cent. of the 7th grade were marked as deficient in both arithmetic and English. The table comparing the central tendency of the group with tentative norms established indicates normal conditions in some subjects, especially for the 6th grade who are above in all tests taken, but slightly below in judgment rating, while in other subjects the 7th and 8th grades are below the standard in varying degrees. These are shown in Table 1A. The greatest deficiency shown is in the grammar tests. This indicates a general low standing of the class, while variations in other subjects could easily be explained by a few outstanding cases.

Tables 2 to 7 inclusive show the distribution of scores in each test. There is a marked clustering about the norms except in the grammar tests. Superficially, this would indicate the expected standing for all except a very few cases in arithmetic, reading, punctuation and simple grammatical usage. But we believe that those in the central group and above, even of the exceptionally



TABLE 1  
AGE-DEFICIENCY DISTRIBUTION

Grade	Age	Arithmetic and English	English	Arithmetic	No Deficiency	Total
IV	9	1		1		2
	10	5		7		12
	11	3		4		7
	12	1		1		2
	13	3	3			6
	not given	1	1	2		4
	Total	14	4	15		33
V	10			1		1
	11	8	1	3		12
	12	5	1			6
	13	5		1		6
	14	3				3
	not given	1				1
	Total	22	2	5		29
VI	No ages given	18	2	17		37
VII	12			4		4
	13		3	7		12
	14	2	2	9		15
	15	4		5		5
	16			1		1
	Total	6	5	26		37
VIII	12		1			1
	13	1	2			4
	14	8	4	1	1	13
	15	9	3	3		15
	16	1	1		1	3
	17	1				1
	Total	20	11	4	2	37

TABLE 1 A  
Comparison of Central Tendencies with Established Norms.\*

	Grade VI %	Grade VII %	Grade VIII %
Woody-Division, .....	+13	+9	-10
Cleveland Survey Arithmetic, .....		-8	-8
Stone Reasoning, .....	+6	+13	-3
Kansas Silent Reading, .....	+20	-7	-2
Parts of Speech, .....		-39	-40
Nouns and Pronouns, .....		-28	-19
Grammatical, .....		0	-4
Punctuation, .....		0	-4
Boston Copying, .....	+9	-21	+6
Judgment Rating, .....	-4	+13	+34

\*The figures of the table represent the per cents of the established norms by which the classes exceed or fall short of the norms.

high standing, should have an analysis of the errors made. Some erroneous habit, some lack of speed or accuracy must have been at the basis of the teacher's estimate in selecting such cases for the extra Summer Session.

TABLE 2  
WOODY ARITHMETIC SCALES, SERIES A—SUBTRACTION FOR GRADES IV, V AND VI—  
DIVISION FOR GRADES VII AND VIII—NUMBER IN EACH GRADE  
THAT SOLVED THE LAST 20 PROBLEMS CORRECTLY

Grade	SUBTRACTION			DIVISION	
	IV	V	VI	VII	VIII
Example No. 16, .....	29	24	32	32	24
" " 17, .....	30	21	34	31	24
" " 18, .....	25	22	32	22	14
" " 19, .....	25	19	31	30	21
" " 20, .....	22	18	32	28	22
" " 21, .....	12	19	31	31	21
" " 22, .....	18	18	32	31	23
" " 23, .....	18	16	29	31	19
" " 24, .....	12	19	31	23	20
" " 25, .....	9	15	26	25	14
" " 26, .....	0	1	27	26	18
" " 27, .....	0	1	24	29	24
" " 28, .....	0	7	25	31	22
" " 29, .....	1	10	13	39	18
" " 30, .....	0	7	23	23	14
" " 31, .....	1	9	19	21	15
" " 32, .....	0	0	14	24	15
" " 33, .....	2	9	16	19	19
" " 34, .....	2	9	12	23	17
" " 35, .....	3	11	12	9	6
" " 36, .....	0	0	0	2	0
Median, .....	21.33	26.5	27.8	29	28.3
Class Score, .....	5.69	7.25	7.38	7.17	6.43
Standard Score, .....	4.22	5.47	6.46	6.59	7.16
Total Number Pupils, ...	34	24	35	34	27

TABLE 3  
CLEVELAND SURVEY SERIES OF ARITHMETIC TESTS—COMPARISON OF MEDIAN  
NUMBER OF PROBLEMS SOLVED BY SEVENTH AND EIGHTH GRADES  
OF JOHNS HOPKINS UNIVERSITY DEMONSTRATION SCHOOL  
WITH THOSE FOR CLEVELAND SCHOOLS

CLEVELAND TEST	EIGHTH GRADE	CLEVELAND EIGHTH	SEVENTH GRADE	CLEVELAND SEVENTH
A	32	27.5	26	26.7
B	25	26	22	21.5
C	19	19	17	17.7
D	22	22.5	22	20.8
E	7	7.8	6	7.5
F	8	10.1	10	8.6
G	5	6.6	5	5.9
H	6	8.5	0	7.7
I	4	4.7	4	4.0
J	4	5.7	4	4.9
K	11	12.5	11	10.1
L	3	3.9	3	3.2
M	4	5.1	3	4.4
N	2	2.6	3	2
O	4	5.5	3	4.1

TABLE 4

STONE REASONING TESTS—DISTRIBUTION OF SCORES FOR SIXTH, SEVENTH AND EIGHTH GRADES

	VI	VII	VIII
Score 3.1—4, . . . . .	3		1
" 4.1—5, . . . . .	2		0
" 5.1—6, . . . . .	4	5	1
" 6.1—7, . . . . .	8	4	3
" 7.1—8, . . . . .	4	8	5
" 8.1—9, . . . . .	2	4	3
" 9.1—10, . . . . .	1	3	3
" 10.1—11, . . . . .	3	1	0
" 11.1—12, . . . . .	1	2	2
" 12.1—13, . . . . .	2	1	0
" 13.1—14, . . . . .	1	2	3
" 14.1—15, . . . . .	0	3	0
" 15.1—16, . . . . .	1		1
" 16.1—17, . . . . .			1
Total, . . . . .	32	33	23
Median, . . . . .	6.95	8	8.5
Score attained by Upper 80% of Class, . . . . .	5.2	6.4	6.6
Standard Score, . . . . .	6.5	7.5	8.75
Percentage that reached Standard, . . . . .	70	70	52
Percentage of Accuracy, . . . . .	77.7	78	80.7
Standard of Accuracy, . . . . .	80	85	90

Under the routine adopted, even in the summer session, the necessary stimulation for the correction of the trouble will not be given. The teachers considered many quite up to standard, as the judgments show, and one remarked that she thought some of the boys just did not take interest in the regular school work, though they certainly had the ability to do it. Only by an elaboration of testing, the scheme of which is built upon the analysis of the individual performance, can the instruction be devised that makes for conservation of energy and interest.

From the standpoint of the class needs, the percentage solving correctly certain problems may be considered. Fifty-three per cent. of the seventh grade solved correctly all except the last three examples in the Woody Test, only two pupils solving the last example. The time limit enters into the evaluation of the degree of difficulty of these problems at the end. Fifty-six per cent. of the eighth grade solved 32 of the 36 problems, with no one getting the last one. The following examples are found to be troublesome for both the seventh and eighth grades:



$$2 \div 2$$

$$13 \overline{)65065}$$

$$75 \overline{)2250300}$$

$$2400 \overline{)504000}$$

$$12 \overline{)2.76}$$

$$\begin{array}{r} 3 \\ \hline 4 \end{array} \div 5$$

$$\begin{array}{r} 5 \quad 3 \\ \hline 4 \quad 5 \end{array}$$

$$\begin{array}{r} 5 \quad 3 \\ 9 \overline{) \quad \div 3} \\ 8 \quad 4 \end{array}$$

$$248 \div 7$$

$$25 \overline{)9750}$$

$$23 \overline{)469}$$

$$3\frac{1}{2} \div 9$$

Four of these and the last three examples of the test are included in the list of troublesome ones found in the Janesville, Wisconsin, Educational Survey. These examples may easily be analyzed into specific abilities necessary for automatic use of the processes and combinations. Does common usage make it more difficult to grasp the division of a number by itself? We ordinarily say, "Give the two children one each," or "There is one apiece for the five." The second and third problems listed belong to a second type, involving zeros that are often puzzling, but when the operation is mastered it is usually of permanence and effectiveness. The fourth problem lends itself to a short cut that should be easily acquired. Decimals and common fractions present difficulties widely variant according to individual needs. Certainly an analysis of these specific errors should be made and met by constructive planning.

In the Copying Tests spelling of words, omitted words and undotted "i's" were decidedly the most frequent errors; many other forms, such as capitalization and punctuation, require no more than the ordinary practice given to such. Grammar Tests show the greatest difficulty with parts of speech, nouns and pronouns.

TABLE 5  
KANSAS SILENT READING TEST—DISTRIBUTION OF SCORES

SCORE				GRADE				
				IV	V	VI	VII	VIII
Scores falling between	0 and	.9,	.....					
"	"	1	1.9,					
"	"	2	2.9,	1				
"	"	3	3.9,	2				
"	"	4	4.9,					
"	"	5	5.9,					
"	"	6	6.9,	4	4	2		
"	"	7	8.9,	3	7	3		1
"	"	9	10.9,	5	4	1	6	3
"	"	11	12.9,	7	1	4	3	1
"	"	13	14.9,	4	3	5	5	3
"	"	15	17.9,	7	2	7	8	4
"	"	18	20.9,	1		2	5	12
"	"	21	23.9,		1	5	3	1
"	"	24	26.9,			4		1
"	"	27	29.9,			1	2	
"	"	30	34.9,		1			1
"	"	35	39.9,		1			
"	"	40	44.9,					
Total number of Pupils, .....				34	24	35	34	27
Median Score, .....				11.1	9.6	16.1	15.4	18.4
Standard Score, .....				9.9	13.7	13.4	16.5	18.8
Twenty-five Percentile, .....				7.0	7.3	11.5	11.8	14.5
Median Score, .....				11.1	9.6	16.1	15.4	18.4
Seventy-five Percentile, .....				13.8	13.4	22.3	20.1	20.3

TABLE 6  
STARCH GRAMMAR TESTS—DISTRIBUTION OF SCORES FOR SEVENTH AND EIGHTH GRADES

Test	No. 1		No. 2		Punctuation Scale	Grammatical Scale		
	Grade		Grade			Grade		
Score	VII	VIII	VII	VIII		VII	VIII	
0.0 — 4.9	0	0	5	2	1	1		
5.0 — 9.9	3	1	10	4	1			
10.0 — 14.9	8	4	4	8				
15.0 — 19.9	2	2	5	3				
20.0 — 24.9	5	6	3					
25.0 — 29.9	4	3	1	1				
30.0 — 34.9	3	1	1					
35.0 — 39.9								
40.0 — 44.9	1							

TABLE 7  
BOSTON COPYING TEST—DISTRIBUTION OF ERRORS

Errors	GRADE					Total No. Errors
	IV	V	VI	VII	VIII	
Spelling, .....	70	30	46	64	20	230
Capitalization, .....	39	23	16	38	17	133
Omitted words, .....	128	78	49	72	37	364
Added Words, .....	9	3	3	9	3	27
Wrong Words, .....	17	28	25	22	22	114
Punctuation, .....	8	4	5	3	4	24
Undotted "i's", .....	41	3	72	99	80	295
Uncrossed "t's", .....	15	1	21	13	3	53
Misplaced Words, .....	*5	0	*14	0	0	19
Total Number of Errors, .....	332	170	251	320	186	1259

\*By one pupil.

TABLE 8  
TEACHER'S JUDGMENT SCALE—DEvised BY PSYCHOLOGY SURVEY  
OF NEW YORK

GRADE	IV					V					VI					VII					VIII					
Score	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Section I, .....	7	15	9	4	0	0	9	11	0	0	0	19	13	6	3	0	10	9	6	12	0	1	6	14	11	
“ II, .....	10	8	8	7	2	0	0	10	10	0	0	4	25	4	6	2	2	11	14	6	4	0	0	6	16	10
“ III, .....	11	9	8	4	3	0	7	9	4	0	0	11	23	4	3	1	4	11	18	3	0	4	4	13	11	
“ IV, .....	5	12	10	5	3	0	7	12	1	0	0	11	18	9	3	1	5	14	9	8	0	3	13	11	5	
“ V, .....	5	17	6	4	3	0	9	9	2	0	0	15	20	1	5	0	12	8	4	13	0	3	13	11	5	
Total Fre- quencies, .....	28	61	41	24	11	0	42	51	7	0	4	81	78	26	16	4	42	56	43	40	0	11	42	65	42	
Average Rating,	12.4					13.3					14.2					16.9					19.3					

Section I—

ABILITY TO MAKE GOOD PERSONAL IMPRESSION. The combined impression made by Facial Expression, Bearing, Speech, Voice, Personal Neatness, Cheerfulness, Courtesy.

Section II—

ABILITY TO RESPOND TO TASKS PRESENTED BY THE TEACHER. Give attention to what is being taught; Become interested in his lessons; Acquire facts; Use his knowledge.

Section III—

ABILITY TO ADAPT CONDITIONS OF SCHOOL WORK. Be punctual; Follow the program; Take responsibility; Be orderly; Do continuous work.

Section IV—

ABILITY TO FIT INTO THE SCHOOL GROUP. Hold his own; Be companionable; Stand up for school interests; Gain respect.

Section V—

PROMISE OF ACHIEVING FUTURE SUCCESS. Ability to think quickly and arrive at the correct conclusion; Initiative; Steadfastness of purpose; Ability to get along with and influence others; Determination to succeed.

All children who rank highest in the group to be judged in the characteristics listed for a section are scored 5. Lowest score 1 should include those showing marked deficiency. If the class represents an unselected group of pupils, more than three-quarters are expected to fall into the three ranks, High (4), Middle (3) and Low (2).



When we follow up the individual records, we find some who are marked deficient only in arithmetic making a satisfactory score in the standard tests in arithmetic, but showing greater deficiency in grammar tests. The seven making highest scores in grammar tests, ranking above the standard score, are all marked deficient in English. This may mean a failure in spelling or composition, in which they are not tested; but it also means that the teacher for the summer instruction did not know the real difficulties so that the situation could be adjusted for the individual's specific needs.

The scores of the individual pupils show more strikingly the wide range of abilities or difficulties. (See Table 9.) The standard norms for the respective grades in the subjects listed are taken as the basis of the computation. The percentage above or below this standard of the individual score is given in the table. The individuals are chosen to represent the extremes rather than the average. Individual A had the highest average ranking of the 7th grade; N the lowest. In each case, however, the contrasting specific disability or ability is very marked. Individual L represents the highest group of the 8th grade. His rating in the tests in which he failed to make the standard score places him not far below the norm. The scores of the 7th grade boy in the various series of the Cleveland Survey Tests (See Table 10) illustrates well the need of analysis of performances. Since this arithmetic test is of the so-called spiral formation, the various fundamental operations enter into it by intervals and with increasing complexity. The span of attention, the speed of performance and the instability in certain automatic processes can be measured more successfully,

TABLE IX

Comparison of Individual Scores with Standard.

	<i>Individual A</i> <i>Best in Gr. VII</i> %	<i>Individual N</i> <i>Poorest in Gr. VII</i> %	<i>Individual L</i> <i>Best in Gr. VIII</i> %
Woody-Division, .....	0	0	+14
Stone Reasoning, .....	0	-30	+55
Kansas Silent Reading, ....	+25		
Parts of Speech, .....	+40	-57	+18
Nouns and Pronouns, .....	+24	-54	-10
Grammatical, .....	-25	+24	-16
Punctuation, .....	0	-14	-3
Boston Copying, .....	-25	-12	+7
Judgment Rating, .....	+14	-17	

thereby. In multiplication this boy never attained a high score, while in subtraction he is consistently capable. Failure in division in no sense describes his status so far as that process is considered. Why he should have failed in the simpler forms, but succeeded in the more complex forms is a problem for study. Addition offers a similar situation. Such presentations emphasize the necessity of diagnosing specific disabilities.

TABLE X

Performance of a Boy in Grade VII in the Cleveland Survey Arithmetic Tests.

	<i>% of Norm.</i>
A Addition, .....	+36
B Subtraction, .....	+36
C Multiplication, .....	+5
D Division, .....	-7
E Addition, .....	-34
F Subtraction, .....	+19
G Multiplication, .....	-8
H Fractions, .....	+5
I Division, .....	-14
J Addition, .....	+5
K Division, .....	+29
L Multiplication, .....	-21
M Addition, .....	-28
N Division, .....	+9

An analysis of the records in comparison with standard scores suggests three groupings. One group includes those who have accomplished what is usually expected of children in such grades. This is shown by the following percentages of the pupils in the 6th, 7th and 8th grades who have attained the norms in the specified subjects.

	ARITHMETIC	GRAMMAR	READING
Grade VI, .....	59%	....	70%
Grade VII, .....	60%	41%	58%
Grade VIII, .....	44%	36%	70%

They need more varied applications to cultivate rapidity and efficient use of the fundamental operations as tools.

The second group, just below the standard score or class median, have specific difficulties, many of which a constructive program, based on the diagnosis made from the tests, could remedy, with economy of effort and time on part of pupils and teacher.

A third group have individual problems. In this class would fall 5 in arithmetic in the 6th grade; 6 in arithmetic, 11 in gram-

mar in the 7th grade: 7 in arithmetic and 7 in grammar in the 8th grade. Some of these doubtless have a much slower rate of learning. A detailed study of their needs would suggest the remedial measures.

The opportunity for instruction during a special session, independent of regular group routine, is an advance step for a system in meeting such individual failures. This should be an opportunity for remedying specific defects rather than marking time. The most significant result of the use of the tests comes from a study in detail of the facts secured, a more accurate rating of pupils, and a reconstruction in method on the basis of the facts obtained.



# A Brief Group Scale of Intelligence for Use in School Surveys

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## I. THE NEED FOR A BRIEF SURVEY SCALE

THE scale to be described in the present paper is the result of an effort to provide a readily-usable instrument which should make practicable two distinct, but related, types of study, in a school or school system. It was desired (1) to build a brief scale which might be used for the measurement of groups—classes, grades, schools or school systems—as regards the level and distribution of general ability among the children of these groups. Such a scale should be thus useful in making comparisons between children in different schools as regards the general intelligence of the pupils attending these schools, and as regards the grouping of the children into classes or sections on the basis of ability. Recent studies have shown marked differences between schools and school systems in this respect.<sup>1</sup> Results from the use of such a scale should also afford a valuable check to aid in the interpretation of findings with tests of achievement.<sup>2</sup>

It was also desired (2) to form a scale, which should be especially studied in its efforts to meet the demands of school principals and superintendents as regards convenience, brevity, cost and ready interpretation of results in terms of school practice, for aid in individual diagnosis. It is essential, if such tests are to be used in the schools as extensively as they should be, that the examination should be brief, that it should not involve intricacies in giving or scoring which might give a teacher trouble in the handling of the

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<sup>1</sup>See for instance PINTNER, R. *The Mental Survey*, Appletons, 1919, or PRESSEY, S. L. *A Comparison of Two Cities and their School Systems by Means of a Group Scale of Intelligence*. Educational Administration and Supervision, Vol. V, pp. 53-62, 1919.

<sup>2</sup>For instance, the children in one school of a city recently surveyed averaged over a year in "mental age" below the children of another school of the same small city. It should be obvious that the same standards of achievement can hardly be set for two schools so different in "pupil material," and that distinct injustice would be done the teachers of the first school, in any educational survey of the system, if the poor native endowment of the children attending this school were not taken account of.

tests, that the blanks should be of a convenient size and easy to handle, that they should be cheap, and that the scores obtained should be readily translated into terms the average teacher can understand—into suggestions for practical action. The writer cannot but feel that insufficient attention has been given to such practical considerations in the building of certain group scales of general intelligence which have recently appeared. Sufficient accuracy for the final diagnosis of any individual case can, of course, not be expected from such a brief scale. But it should be possible, if the tests are chosen with special reference to their ability to diagnose mental defect and mental superiority, to gain a sufficiently clear indication to serve as a basis for further study—to make a preliminary selection of those individuals deserving further consideration.

## 2. DESCRIPTION OF THE SCALE

The Scale consists of four tests, two on each side of a 9-inch by 12-inch sheet arranged as a four-page folder. Each test consists of twenty-five problems—each on one line—giving a total of 100 problems or items in all. The headings, examples and first five “lines” of each test are reproduced below. In giving the first test, the children are told that the words in each line will make a sentence,

### MENTAL SURVEY SCALES\*

Schedule E

#### “Cross-out” Tests

Name.....Boy or Girl?.....  
 Age.....Birthday.....Grade.....  
 Teacher.....School.....  
 Place.....State.....Date.....

### TEST I. VERBAL INGENUITY.

Examples: (a) see a I man on.

(b) knife chair the sharp is.

(c) John broken window trees has the

(1) the cat at see.

(2) boy was sky the sick.

(3) bread sweep will the kitchen I.

(4) are going yesterday to-morrow we.

(5) me mine give my straw hat.

Score (1).....

(4).....

Total .....

TEST II. LOGICAL JUDGMENT.

- Examples: (a) dog, cow, horse, oak, cat.  
 (b) book, newspaper, magazine, pamphlet, photograph.  
 (c) base-ball, skating, checkers, tennis, dominos.
- (1) coat, shoes, hat, gloves, sail.  
 (2) oats, wheat, barley, cotton, rye.  
 (3) satin, silk, fur, calico, serge.  
 (4) fly, ant, bee, grasshopper, mouse.  
 (5) bread, meat, vegetables, hay, fish.

TEST III. ARITHMETICAL INGENUITY.

- Examples: (a) 2 4 6 8 9 10 12  
 (b) 7 6 5 1 4 3 2  
 (c) 1 2 4 8 16 17

- (1) 1 2 3 9 4 5  
 (2) 2 4 6 7 8  
 (3) 9 8 7 6 5 2  
 (4) 11 10 8 6 4 2  
 (5) 5 7 10 15 20 25

Score (2).....  
 (3).....

TEST IV. MORAL JUDGMENT.

- Examples: (a) Gambling, lying, drunkenness, murder, smoking  
 (b) begging, buying, trading, cheating, borrowing  
 (c) dullness, foolishness, laziness, weakness, poverty.
- (1) fighting, killing, hating, quarreling, hurting.  
 (2) borrowing, gambling, overcharging, stealing, begging.  
 (3) love, hate, fondness, dislike, liking.  
 (4) dancing, drunkenness, flirting, over-eating, smoking.  
 (5) holiness, reverence, piety, obedience, wickedness.

but that there is, in each line, one word that cannot be used in the sentence; this extra word they are to cross out. The second test presents a very different type of problem; in each line four things are named, which are, in some important way, alike, and one thing which is different from these four—which does not belong with them; and the children are to cross out this incongruous element. In the third test the numbers in each line are arranged according to some rule, but there is in each line one number that breaks the rule; this number is to be crossed out. In the fourth test the problem is simply to “cross out, in each line, the thing that is worst.” Five minutes are allowed for work in the first and third tests and four minutes on the second and fourth.

In deciding upon the makeup of the scale, the writer was quite as much interested in obtaining tests which might prove each of some independent value, as in forming a nicely balanced and properly proportioned examination. Test I was planned as a measure



of language ability, somewhat similar to Trabue's scales in the general nature of the abilities involved. It is, however, superior to these scales in that writing is eliminated, and scoring made thoroughly objective. Test II might better be called a test of Practical Judgment, and of information. It should be noticed that each line involves a problem of four-fold similarity and four-fold difference; the subject must make sure that the four objects he groups together are *all* alike, and that the thing he eliminates is different from *all* the other four. That is, there is here, as in the other tests, great condensation of problem. Test III, it has been hoped, might prove a test of potential arithmetical ability,—and give distinctive findings in classes where the ability of the children was good, but the teaching of arithmetic poor. Test IV is the result of an effort to express in group test form the essential problem of the Binet "definition of moral terms" test, which recent research has shown to be one of the most valuable tests of that scale.<sup>3</sup>

Test IV is probably quit as much a test of vocabulary as of moral discrimination; but this last element is surely involved to some extent, and, in so far as it is, it makes the test of especial interest for use in the survey of reform schools, or other delinquent groups. Each test thus has a distinctive interest of its own. The present paper deals only with the scale as a measure of "general ability." The writer hopes soon, however, to have data bearing on the worth of each test for such special purposes as have been suggested above.

Certain general features of the examination as a whole remain to be noted. (1) Certain special devices have been employed to make the directions readily understood, thus eliminating zero scores and keeping the problem of each test free from what may very well be a highly special conditioning factor—ability to understand elaborate directions.<sup>4</sup> In the first place, in order to avoid mechanical and over-rapid giving, and to develop the interest of the class, the directions have been arranged so that the children take part, by

<sup>3</sup>See for instance BRIGHAM, CARL. *Two Studies in Mental Tests*. Psychological Monograph Series Whole No. 102, Vol 24, 1917, and PRESSEY, S. L. and COLE, L. W. *Are the Present Psychological Scales Reliable for the Measurement of Adults?* J. of Abnormal Psychology, February, 1919.

<sup>4</sup>That this has been accomplished may be seen from the fact that of a total of 176 third grade children tested in a recent survey no case made a zero score on the entire examination, and there was no more than 6% failure on any one test (the third), with 1%, 4%, and 4% on the other three tests.

Peter Sandford

answering certain questions, in the giving. This may seem superficially to add an element of looseness to the examination; but the writer is convinced, after extended trial, that if anything the opposite is true. The questions asked are invariably answered at once by a majority of the class; and they are so framed as to call forth exactly the same answer in every instance. With such an arrangement, perfunctory, half-understood giving is not possible; the rapidity with which the directions proceed is automatically regulated according to the quickness with which the children understand them. The directions for the first test are reproduced below.

Look at the first test, example a, the first example. The words are "see a I man on." In this order the words don't make sense; but they can be made into a sentence if you leave out one word. What is the sentence?...What is the extra word?...You see "on" is crossed out, because you can't use it in the sentence.

Look at example b. What sentence can you make from these words?...What is the extra word?...Cross out the word "chair" in just the way that "on" is crossed out in the first example.

Look at the last example. What is the sentence?...What is the extra word?...cross out the word "trees."

Now—everyone—attention! work out the other twenty-five sentences in the same way. In each list there is one *and only one* extra word. Cross it out. (Time allowed pupils, 5 min.)

In the second place, the tests have all been formulated in such a way that a very colloquial and simple statement of the problem is possible, and—what is more—in such a way that the act of the child in indicating his answer is a natural and interesting solution of the test problem. In each test the subject eliminates, by crossing out, an irrelevant or extreme element. The device is believed to be of great value—a more complete account has already appeared, to which the reader is referred for further discussion.<sup>5</sup>

(2) The examination is highly integrated. The directions are of the same form for each test. They call for the same sort of response—the crossing out of an irrelevant or extreme element. The arrangement of the test material is thoroughly systematized; each test has three examples, and 25 problems, placed in each instance in the same way on the page, and always one problem to each line. This carefully studied organization is again an effort to free the essential problem of the test from all irrelevant and ad-

<sup>5</sup>PRESSEY, L. W., *A Group Scale of Intelligence for use in the First Three Grades*. Journal of Educational Psychology, September, 1919. Also a preliminary report *Cross-out tests: with Suggestions as to a Group Scale of the Emotions*, Jr. of Applied Psychology, June, 1919.



ventitious circumstances such as peculiar form, artificial directions, special method of indicating answer, which might obscure the definiteness of the results as indicative of abilities along the lines of the functions involved in the test proper, and to make the giving and scoring as easy as possible.

(3) A special effort has been made to make the examination practical and practicable for extended work in schools, in institutions, and for "mental surveys." The intention has been that the scale should be given by teachers, investigators, or field workers, without special training in the use of mental tests, and that the blanks should be readily and accurately scored by such untrained workers. The directions are short, occupying only one side of a typewritten sheet, and are read verbatim by the examiner. The scoring is very simple and rapid; no further directions than this are necessary, that each word or number correctly crossed out counts one point, but that only one word must be crossed out in each line. It is possible, the writer has found, for student help to score the blanks at the rate of 90 an hour; the average teacher can score the entire four tests in one minute. The blanks are convenient in size and shape, and are cheap.<sup>6</sup> A mental survey is thus possible in a school at a minimum of expense and labor. The writer feels that the examination is especially well considered in these respects.

### 3. DEVELOPMENT OF THE SCALE, AND FIRST NORMS.

The scale was developed from work previously done with a more elaborate examination already described elsewhere.<sup>7</sup> Careful analysis of the results obtained with this scale leads to the conclusion that the tests of which it was composed varied markedly in their capacity for differentiating degree of mental ability, and that, by proper selection of tests, a much briefer examination of approximately the same differential value might be formed. The "Cross-out" tests are the result of an effort to form such a scale.

<sup>6</sup>They are at present being sold at 75c per hundred, with materials.

<sup>7</sup>PRESSEY, S. L. and L. W., *A Group Point Scale for Measuring General Intelligence, with First Results from 1,100 School Children*, Jr. of Applied Psychology, Vol. 2, pp. 250-69, 1918. For details of the analysis described below, see also *The Practical Efficiency of a Group Scale of Intelligence*, same Journal, Vol. 3, pp. 68-80, 1919.



The "Cross-out" tests were formulated in the spring and summer of 1918, and were given first trial in a group of country schools in the fall of that year; the Bloomington schools were at that time closed on account of the influenza epidemic. These results served as a rough trial of methods and selection of items. Mimeographed forms were used. Preliminary forms were then printed and the scale given to all the children in the fourth, sixth and eighth grades of a small Indiana city (city "A")—a total of about 500 cases.<sup>8</sup> These papers were analyzed by test and by item and the tests revised on the basis of the findings. The scale was next given in all the schools of a second city (City "B"), to all the children from the fourth grade through high school—a total of 850 cases being tested.<sup>9</sup> These results were again analyzed in detail, and further revision decided upon, to obtain better grading, and to eliminate possible ambiguity in certain of the items. The examination was now used in a third complete survey—giving a total of 1,208 cases—of the school population of another city (City "C"); all the children from the third grade through high school were given the scale. The results from the fourth, sixth and eighth grades were once more tabulated by item, the percent passing each item at each grade converted into P. E. deviations, and the items arranged on a P. E. scale, using the sixth grade as a base. This resulted in the present final form of the scale.

#### MEDIANS FOR EACH TEST

Tests Grade						Tests Age					
	1	2	3	4	Cases		1	2	3	4	Cases
3	6.6	6.6	6.8	6.2	89	9					
4	9.1	10.9	9.6	9.5	452	10	9.4	10.8	9.7	9.7	267
5	10.8	12.3	11.1	11.3	393	11	11.6	13.2	11.3	12.1	269
6	12.6	14.4	12.9	13.3	418	12	12.7	14.0	12.5	12.8	278
7	14.8	15.8	14.5	15.2	323	13	14.7	15.2	14.0	15.1	241
8	16.4	17.4	16.9	17.3	265	14	16.4	17.3	15.3	16.4	261
9	19.8	18.7	17.4	19.5	171	15	18.4	17.9	16.7	18.4	199
10	20.6	19.4	19.2	19.5	143	16	20.8	19.4	18.8	19.5	140
11	20.8	19.9	22.0	21.0	106	17	21.4	19.5	20.9	19.5	87
12	22.5	20.1	22.1	20.3	33	18					

<sup>8</sup>The writer wishes to express his obligations to Superintendents E. C. Dodson, of Greencastle Indiana, E. W. Montgomery of Bedford, R. W. Tirey of Washington, E. E. Ramsey of Bloomington, and to the principals and teachers in their schools, for their unfailing kindness and cooperation. The research was carried through in a year which placed unusual burdens upon the schools. The fine cooperation which was, nevertheless, given to this work was deeply appreciated by the writer.

<sup>9</sup>As evidence of the ease with which the examination can be handled it may be said that all these cases were examined, by the writer himself, in one school day, and that the total cost of scoring blanks, with student help, was \$5.00.

TABLE I  
CROSS-OUT SCALE: DISTRIBUTION OF SCORES 5,503 CASES

Score	Grade												Age								Score
98	4	5	6	7	8	9	10	11	12	9	10	11	12	13	14	15	16	98			
96							1	1								1		96			
94						2	2	5	1				(5)	(55)	1	1	3	94			
92					2	2	2	2	5						1		3	92			
90				1	2	3	8	5	20			1		1	3	3	7	90			
88					5	7	10	12	8			1		1	4	4	11	88			
86				4	5	7	10	12	10			1		1	4	5	9	86			
84				2	7	18	12	13	4			1		1	4	6	9	84			
82			1	3	10	7	17	12	8			1	6	11	1	7	10	82			
80			3	7	23	19	13	20	8			1	15	16	9	14	13	80			
78			2	6	28	27	19	7	4		1	3	5	22	11	16	9	78			
76			3	10	34	24	14	9	4		1	4	10	29	17	13	10	76			
74		3	5	16	33	31	7	12	5		2	8	9	25	17	14	8	74			
72		1	12	20	38	23	20	7	1		2	6	18	28	11	13	11	72			
70			8	26	42	20	9	7	2			12	17	26	13	9	12	70			
68	1	4	27	55	63	20	5	7	1		11	20	39	34	17	18	7	68			
66		8	20	41	44	26	11	4	1		1	9	12	38	35	20	10	66			
64	1	7	32	46	78	12	6	4			1	10	26	37	38	19	12	64			
62	3	17	45	80	46	12	4		1		3	10	43	41	40	16	8	62			
60	3	17	52	75	56	12	7	1			4	16	36	48	54	12	12	60			
58	7	22	66	80	33	7	4	1			6	27	43	50	59	12	7	58			
56	2	37	60	83	42	1	4		1		2	21	42	69	44	13	5	56			
54	11	46	79	83	24	5	3				16	31	60	50	47	16	6	54			
52	16	63	87	58	39	2	1	1			15	47	55	58	46	9	4	52			
50	24	62	83	70	28	4		1			18	50	61	40	54	10	7	50			
48	41	61	77	46	17	7					31	36	43	57	37	9	6	48			
46	43	75	76	39	15	2					23	57	43	64	35	7	2	46			
44	50	84	81	37	7	3					29	67	62	47	41	6	4	44			
42	61	92	53	33	2						34	56	45	51	26	6		42			
40	54	86	48	24	2						45	59	45	43	31	4		40			
38	73	66	35	16	1						33	47	43	41	19	2		38			
36	83	54	31	9	3						39	50	32	40	16	5	2	36			
34	77	78	16	8	1						48	64	24	23	14	3	3	34			
32	81	40	19	11							44	36	27	20	13	2	2	32			
30	69	36	10	4							35	34	22	17	11	3	1	30			
28	57	30	11	1							33	28	30	12	8	2		28			
26	44	13	5	2							21	24	10	12	4	2		26			
24	48	14	5								21	26	12	10	6	1	1	24			
22	29	7	2	1							17	16	9	4	1	2		22			
20	35	6	2								12	15	11	3	5	1	2	20			
18	15	4									8	15	2	2	1			18			
16	13	2	1								7	7	11	1	2			16			
14	11	1		1							8	4	3	6	1			14			
12	6	4									1	1	4	4	2			12			
10	4										2	2	3	1	1			10			
8	1										1		1					8			
6	3	2									3		2	1				6			
4	1										2		1					4			
2	3										2		2					2			
0	1				*					(453)	(146)	(115)	(14)	(8)				0			
No. Cases	971	1042	1067	998	723	303	184	151	74	1011	1035	1034	1038	960	297	226	162	No. Cases			
75 P. C.	42.7	50.9	58.4	63.7	72.1	79.2	83.3	87.5	89.9	38.5	48.8	56.1	61.9	69.2	73.9	78.8	84.3	75 P. C.			
Median	35.7	43.7	51.4	57.4	65.2	73.6	77.6	81.6	83.8	39.8	46.3	52.1	58.2	64.6	69.9	76.6	81.6	Median			
25 P. C.	29.0	36.9	44.7	50.5	58.1	66.7	70.2	75.0	78.3			33.8	42.1	47.7	54.0	60.4	68.1	25 P. C.			

\* In reckoning all age norms cases below the fourth grade, and examined with the "Primer Scale," have been counted in as at the bottom of the distribution. Similarly, for ages 12 and 13, cases missed in three school systems by omission of the high school from the survey have been included as at the upper end of the distribution. For ages above 13 on cases from cities in which the high school was examined have been included. It should be added that, in tabulating for the age norms, age at last birthday was used; these norms are thus norms for 10.5, 12.5, 14.5 and not for 10.0, 12.0 or 13.0.

Attention is also called to the median ages given with the grade norms. These median ages will, it is believed, prove very convenient in comparing schools with different age-grade distributions, or examined at different times in the school year. In using these median ages a principal or superintendent should simply compute the median age at time of examination for each grade in his own school (using age at last birthday as given on the blanks) and compare with the median ages given in the norms. If, for example, a given sixth grade is found to have a median age of 12.7 instead of 12.2 then one-half of the inter-age interval, or 3 points, should be added to the norms, in order to make a fair comparison.

† Cases below fourth grade.

‡ Median age 10.12, 11.16, 12.17, 13.00, 13.92, 15.12, 16.05, 17.19, 17.56.

## 4. THE "RELIABILITY" AND "VALIDITY" OF THE SCALE.

In order to obtain some indication as to the "reliability" of the measures obtained with the scale, the results from the final form of the examination in the seventh grade of City "E" (86 pupils) were handled by obtaining the scores on alternate items of each test, thus forming two half scales. The scores on the half scales were then correlated and a coefficient of reliability obtained according to

the formula:  $r_2 = \frac{1 + \sqrt{1 - \frac{1}{2}}}{2\sqrt{1 - \frac{1}{2}}}$  (Brown's formula). The coeffi-

cient of reliability thus determined was .82 for the whole scale; for test I the coefficient was .81, for test II .59, for test III .75, for test IV .64.<sup>10</sup> "Reliability" as thus calculated indicates, of course, consistency from item to item; it is interesting to note in this connection that the reliability appears lowest on the two tests involving, to a large extent, information.

Throughout the development of the scale, the validity of the tests was frequently checked up by correlation with teachers' estimates of ability, with school standing, and with other independent criteria of ability. Data were also obtained to make certain that the tests were not unduly sensitive to such special factors as sex, social status, and so on. However, some more detailed information was desired as to the accuracy of the scale in measuring general ability, and as to the specific contribution of each test to that measure. It was evident that some reliable outside standard must be found. Since the scale was intended for use in the schools, evaluation should best be related to ability as it shows itself in school work. Correlation with marks was considered; but, as has been frequently pointed out, school grades are the composite expression

<sup>10</sup>A probable error was also calculated from these half scores, using the formula  $P. E. = \sqrt{2} \times .5978 A. D.$

The A. D. is the average difference between score on even and on odd numbered items; the formula is simply the usual formula for the calculation of the P. E. of a test, with allowance for the fact that half tests are being worked with. The P. E. of the scale, as thus calculated, was found to be 3.65 points, or about seven months; the P. E. of test I was calculated to be 1.03 points, of test II 1.32, of test III 1.41, of test IV 1.41. The method is the suggestion of Dr. W. S. Monroe, to whom the writer wishes to express his appreciation. (See also PRESSEY L. W. *A Group Scale of Intelligence for Use in the First Three Grades: Its Reliability and Validity*. Journal of Educational Research, April, 1920.)



of a number of factors,—conscientiousness, interest, previous preparation, as well as native ability. Correlation with a composite score from a large number of other tests was also possible. But it was felt that such evaluation had little except a round- about connection with practical school problems, and would not clearly indicate the ability of the scale to deal with these problems. Besides it might very well be true that some children show a somewhat special “test-ability” which is more or less distinct from a more sustained capacity for serious tasks; this “test-ability” would, then, serve as a constant error, which could not be eliminated by merely increasing the number of tests.<sup>11</sup>

The average of the ratings of four teachers upon the general ability of each child was finally settled upon as the most satisfactory outside standard. The work was done in the Junior high school of City “C,” which was tested just before the final revision of the scale. The changes made following this survey were, however, slight; the present final form may be supposed slightly more accurate than the results below would indicate.

It was felt that one of the important sources of error in such teachers’ estimates was the tendency to confuse effort or preparation with ability. Separate ratings were, therefore, required on the three factors of preparation, ability, and effort, to force a distinction; but only the ratings in general ability were used in the present study. The form of the rating scale was modeled directly upon the army officers’ rating scale. Each child was rated by the four teachers of the four promotion subjects; the teachers had not, of course, been acquainted with the test findings. The seventh grade was finally chosen for detailed study—partly because, being the middle grade of the school, it was probably the most representative and partly because other data, which the writer hopes to use later, were more abundant for the seventh grade. Complete results were available for 116 seventh grade cases.

The correlation of the whole scale with the pooled estimates above mentioned was .64 (it might be added that the correlations for the

<sup>11</sup>For discussions of this problem of the independent criterion see for instance THURSTONE, L. L., *Mental Tests for College Entrance*, Jour of Educ. Psychol., Vol. 10, pp. 129-42, 1919, or RUMML, BEARDSLEY, *The Reliability of Mental Tests in the Division of an Academic Group*, Psychological Monographs, Vol. 24, whole No. 105, 1917.

other two grades were .60 and .75).<sup>12</sup> The correlation of each test with the pooled ratings, and the intercorrelations between the tests, were as follows:

	1	2	3	4	5	
1 .....						1—pooled ratings
2 .....	.37					2—test I.
3 .....	.42	.28				3—test II.
4 .....	.44	.18	.17			4—test III.
5 .....	.58	.41	.37	.38		5—test IV.

The method of partial correlation was used with the five variables given above. The resulting third-order coefficients, of each test with the pooled estimates, were:

r	.146	r	.250	r	.285	r	.369
12.345		13.245		14.235		15.234	

The regression equation, showing the dependence of teachers' rankings on the four tests, is as follows:

$$\begin{array}{cccccc}
 x & .1048x & .1515x & .1979x & .2218x & \\
 1 & 2 & 3 & 4 & 5 & 
 \end{array}$$

It is evident that the last two tests are the most valuable of the four and should perhaps be weighted. The fairly low intercorrelations between the tests would suggest that each test has a distinct contribution to make the score; and this suggestion is further borne out by the partial correlations. If it should be decided to use weighting, the application of the regression equation above gives a slightly more exact indication of the child's mental ability. The gain in using the weighting is, however, very slight: it raises the correlation from .64 to .67; as the scale is used in the schools, the tests are, of course, not weighted.

The scale would thus appear to be a fairly efficient measuring instrument for differentiating degrees of ability among school children, that is, for the second purpose mentioned in the first section of

<sup>12</sup>It is interesting to note in this connection that Ruml obtains a correlation of .66 between tests and similar rating on college students, that Thurstone obtains .61 for his scale with his Freshmen. Terman states that the correlation of Stanford Binet with estimates—presumably a single estimate on each child—is .48 (*The Measurement of Intelligence*, Houghton Mifflin Company).

the paper,—for aid in individual diagnosis—and should have a definite value for such use. How valuable it may be for the first purpose mentioned,—that of group comparisons—can only be determined after a large amount of data has been accumulated. As far as can be told at present, it would seem distinctly serviceable for such a purpose. In the surveys already made, clear-cut differences have been found between “fast” and “slow” sections, between schools, both in the ability of the children attending them and in the amount of adjustment made by the schools to the capacities of the children, and between average school children and children in institutions. The writer feels that altogether too little attention has been paid to these matters of group differences, and is making special effort to gather data bearing on the matter.

## 5. SUMMARY.

1. The paper describes a brief group scale of intelligence for use in grades 4-8 inclusive. It is intended that the scale should be used (a) as a survey scale in making comparisons between sections, classes, grades, schools, or school systems, as to the level and distribution of general intelligence in these groups, and (b) as an aid in individual diagnosis.

2. The scale is made up of four tests each of twenty-five items (a total of 100 “points”). A special effort has been made to obtain condensation of matter and convenience of form:—the entire scale is printed on two sides of a 9" by 12" sheet; the examination can be given in twenty-five minutes, and the blanks scored in less than one minute apiece.

3. The scale in its present form is the result of three revisions, involving results from a total of about 4,000 cases. First norms, for the examination in its final form, are presented.

4. Intensive study of the results from a large Junior high school shows correlations with pooled teachers estimates of ability, averaging .66. A reliability coefficient of .82 and a P. E. of about 4 months was found.

5. A study of the findings by the method of multiple correlation shows the tests to be fairly well selected and integrated.



# The Use of Psychological and Trade Tests in a Scheme for the Vocational Training of Disabled Men

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## I. THE PROBLEM.

Psychological and trade tests in vocational guidance may be divided with some overlapping into two groups. Those of the first group are designed to select persons for definite sorts of work. Those of the second group are designed to select a definite kind of work for the person to be trained. The first is comparatively simple because where there is a position to be filled, the employer has only to determine the degree to which each applicant possesses the necessary qualifications for that particular kind of work. On the other hand, when the problem is to discover what sort of work a person can best be trained to do, the field springs to enormous proportions, because of the almost unlimited number of alternatives which may be considered as possibilities. This paper will deal with the second group in its relation to the vocational training of disabled men.

In the consideration of this problem certain facts should be borne in mind. First of all the man who is sick, wounded, or who has undergone severe mental shock requires special consideration. He requires guidance and encouragement of a sort which can only be given by a person who understands the difficulties under which he is laboring. In other days it was considered sufficient to keep the wounded soldier alive, ultimately returning him to society to take up life as best he could. The present aim, fortunately, is to strive by all possible means to return him physically and mentally as nearly normal as possible, and to provide training so that he may not be a burden to the community, but occupy a useful and respected place. Again it should be remembered that training in taking no thought for his own sustenance; in relying upon others for definite direction as to most of his acts; and in the subordination of self

interest has tended to rob the soldier of initiative and the controlling factors of civilian life. The result of the training in other wars has been to produce a great group of persons—political “heelers,” soldier beggars, and pensioners, who, although able bodied, made no effort to work, but were satisfied to exist by the labor of others.

On the other hand, it is safe to assume that most of the soldiers, after their discharge from service will be more efficient (at least potentially) than when they entered training. This is due to the breaking down of habits by the complete change of daily routine. The recruit who found himself thrown into an entirely new environment must necessarily have met the strange conditions by a development of innate American resourcefulness which permitted him, instead of sinking, to swim and advance. When called upon suddenly to stand and deliver, with no alternative offered, his self aid becomes his source of sustaining power. Of necessity he met new conditions as they arose with quick and decisive adaptation which must certainly have resulted in self-building. We may expect that the things which in his past civil life were accepted as a matter of course, in the future will be subjected to keen critical scrutiny with the idea of betterment. Constructive criticism is the sure road to progress and attainment and to a broader outlook on life.

## II. WHAT HAS BEEN DONE.

Very little was accomplished comparatively speaking, prior to the summer of 1917. It is safe to state that prior to this time there was no scientific basis of determining a man's chance of success in any definite field. The educators who train men for life and the employer who hires them—were alike at a loss. It is true that certain experts in experimental and applied psychology has devoted months of time to the problem, and had obtained fairly accurate knowledge of what qualifications were demanded of persons entering certain occupations. However, the number of occupations in which acceptable results had been secured was less than a dozen. Comparison of this figure with that of the total of about 10,000 gainful occupations enumerated in the Occupational Index of the United States Census shows forcibly how little had been done. It should be added that the tests employed were usually unwieldy and required the presence of a trained psychologist.

Soon after the United States entered the World War, the American Psychological Association took steps to begin a work in applied psychology the far-reaching effects of which no person at the present time can estimate. There can be little doubt however, that the initial effort of this organization led to a greater increase in scientific management of men than had ever been made before in a like period of time.

Briefly reviewing this work in its relation to the problem of vocational guidance it will be noted that it was carried on along two main lines, which may be designated as group and analytic. Both are of prime importance. The group work consisted of examining recruits to determine general intelligence through the use of standard examinations. The examination consisted of a group of tests each of which was designated to test one or more mental functions. The total measured the man's general intelligence.

These tests were of two kinds and could be given to groups of from one to two hundred men. The time required for each group examination was about fifty minutes, so that one examiner and a small group of clerical helpers could examine between 500 and 1000 men a day. The results of these tests were found to be of extraordinary value in accelerating training of recruits, notably in such difficulties as:<sup>1</sup>

1. The discovery of men whose superior intelligence suggests their consideration for advancement, for example, to posts as non-commissioned officers.
2. The discovery of men whose low grade of intelligence renders them either a burden or a menace to the service.
3. The selection and assignment to development battalions of men who are so inferior mentally, that they are suited only for special work.
4. The prevention of undesirable difference of mental strength between different regiments or companies.
5. The early recognition of the mentally slow as contrasted with the stubborn or disobedient.

As almost two million soldiers were examined with these tests, the examination papers furnish a wealth of material for research. Assembling the scores it was found that although the distribution

<sup>1</sup>From Army Mental Tests.



of intelligence scores in any one trade or profession was enormous, they fell into fairly distinct groups according to the civil occupations of the recruits. Selecting at random, the group which included laborers, teamsters, tailors, and barbers averaged "C" minus; that which included policemen, boiler-makers, painters, cooks, and butchers averaged "C"; that which included bookkeepers, telegraphers, clerks, and photographers averaged "C" plus; that which included dentists, draftsmen, typists, and Y. M. C. A. secretaries averaged "B"; and that which included army chaplains and engineer officers averaged "A".

The analytic work differed from the group testing in that it had to do largely with individuals, and permitted of experiment. It required more ingenuity and frequently represented schemes which are of a most complicated and involved nature, and require elaborate apparatus. The general intelligence tests for individuals and the Army trade tests may also be classified in this group. The results of the analytic work are best illustrated in the selection of an improved and accelerated training of aviators, gun pointers and other kinds of service in which a large number of complicated facts were involved.

### III. WHAT SHOULD BE DONE.

If a disabled soldier is to be returned to society with his possibilities fully developed, it is important that the repair should start at the bedside. He should be taught to do useful things which at first require little effort, and which, if possible, should be made the beginning of a profitable occupational career. This is the beginning of vocational guidance as applied to each man, and greatest care should be exercised that the foundation is properly laid. In most instances it is best to begin the training with generalities; developing initiative, resourcefulness, industry, value of time and material—and a desire to work toward a goal. As the subject improves physically, athletic sports should be made to play a part in his rehabilitation. At no time is the question of morale of graver consideration than when the disabled soldier begins to look into the future. It is as important to teach a man to be happy in his work as it is to train him for the vocation.

Just as it was found necessary in April 1917 to devise some quick and accurate means of identifying the recruits who could

learn the duties of a soldier in the shortest time, so now it becomes essential to discover the quickest and surest method of bringing them back to a useful civil life.

Where the nature of his disability makes it possible, the man should be brought to adapt himself to the same or some other branch of his previous occupation. Some of the advantages which would result from this are that the efforts in his training would be minimized; it would tend to keep from over-crowding the other trades, and would be less liable to interfere with the rules and regulations of trade unions.

Before the vocational guidance director can go far, it is absolutely necessary that he have a definite knowledge of the fields of industry. He must have some means of estimating and knowing what is best to be done in each case. It is easy enough to say that we can select the job, and then train the man to fill it. The accomplishment is a wholly different matter. Men are not to be measured with rules, nor to be catalogued and shelved like books. Accurate placement of men can only be secured thru scientific placement. In using scientific methods of placement a step will be taken toward the solution of one—if not of the greatest—social and industrial problem.

#### IV. WHAT PSYCHOLOGY CAN DO.

There are two angles from which scientific vocational guidance must be approached:

1. What constitutes the job?
2. What are the qualifications of the men to be trained?

Job specifications should be prepared as the first step toward answering question one. This is comparatively an easy matter, and can be best accomplished by a survey of the community where it is expected the men will go after they have finished their courses of training. Such a survey would help to systematize the various occupations and at the same time show for what particular trades the disabled men could be trained to compete on nearly equal terms with their normal fellows. For such a survey it would be well to secure information from editors of trade journals, manufacturers, and trade unions. After the data has been collected outlines could be prepared somewhat after the following plan:

1. List of occupational branches of the trade under consideration.
2. Statement of what the work of each branch consists.
  - (a) Amount of education necessary.
  - (b) Amount of moving about necessary.
3. What would disqualify a person, as loss of limbs, loss of hearing, etc.

After the job specifications have been determined, it will be necessary to devise a series of trade tests to measure efficiency and to make sure that a man said to be skilled in any trade could really do the work demanded.

These tests may consist of verbal questions; require correct solution of trade problems; demand identification of test-tool parts, and technical drawing; and should classify a man as to his ability to do the work of a novice, apprentice, journeyman, or an expert.

Developing such tests involves the expenditure of an enormous amount of time and labor. A good start has been made in the Army Trade Tests, which measure proficiency in each of about one hundred trades. Some modification would fit these tests for use in the present need, and they have already been standardized through the successful examination of about 125,000 men.

Each test before being accepted must pass through a process of careful evolution and trial. To be of value it must rest on a scientific analysis of the processes to be tested and finally systematized and standardized.

*What are the qualifications of the men to be trained?*

In selecting a man for a specific sort of training it is necessary for the vocational guidance expert to make a preliminary survey of the situation to determine his future course of action. A plan similar to the following might be used:

- (a) What capacity has the man to absorb training.
- (b) For what sort of training is he best fitted?
- (c) Of what does the course selected consist?
- (d) What is his previous occupational history and what is its present value?



(e) His willingness to apply himself.

(f) Individual differences.

(a) In estimating a man's capacity to absorb training, the first thing to be determined is his general intelligence rating. This can be secured through the use of mental tests, and the results should be compared with his score made in the army. While the present scheme of mental testing is by no means perfect, verified statistics secured in the army prove it of far greater value in selecting men than were personal opinions. Another index to the subject's capacity is his educational history and vocational success.

(b) In determining what sort of training a man should have, his wishes must be consulted as a first step

If it is later found that he is unfitted for a particular vocation, the interviewer must with rare tact and fair judgment lead him to conclude that he would be better satisfied in another field.

(c) Determination of the course of training can best be arrived at by following a plan similar to that already suggested.

(d) A study of the subject's previous occupational history will shed much light on his potentialities. Trade tests should be applied to verify his statements, as well as to determine to what extent his disabilities have incapacitated him for continuance in that particular vocation. Through these tests he can be rated in that vocation, and at the same time his value in related fields of endeavor can be determined.

(e) Willingness to apply himself cannot be estimated with any mechanical scale. The keen interviewer can, perhaps, determine approximately what the subject's attitude will be toward the contemplated course of training, provided that all conditions remain normal. Like the closely allied volitional traits, honesty, tact, cheerfulness, initiative, etc., willingness is dependent upon the condition of the man's morale.

(f) Individual differences like different abilities must be carefully investigated and recognized. Just as there are no two persons identical, so not two courses of training can be expected to follow parallel lines. Each man interviewed presents new difficulties and problems, each of which must be approached in a different manner.

## CONCLUSIONS.

1. The problems of training men for positions where they can accomplish most for society and attain greatest happiness is vital and should be met by persons trained in interpretation of mental processes. Skill in influencing men comes from knowledge of the mental processes and factors which determine the behavior of men.
2. Classification of individuals can be accomplished by use of intelligence tests, trade tests, and expert interviewing.
3. A man must be selected for specific lines of training in terms of what he can now do, and assigned only after an exhaustive analysis of his qualifications and of the job specifications.
4. Vocational guidance can be scientifically conducted. Psychology supplies a large part of the foundation on which the successful vocational structure must be built.

# COMMUNICATIONS AND DISCUSSIONS

## SOME RESULTS OF MONROE'S DIAGNOSTIC TESTS IN ARITHMETIC

At the beginning of the school year, it was decided to return to school conditions as they were before the war. With this end in view, standardized tests were given to find out the abilities of the children in the various school subjects, to diagnose the teaching situation, and to suggest remedial instruction. Until recently, examinations have been the means of finding out the results of instruction. In most examinations there are questions put that are two to three times as hard as other questions for which equal credit is given. Hence, the evaluation of the pupils' work is inaccurate. The standardized tests offer a measuring scale of samples of known quality so arranged that they are graduated as to difficulty and excellence.

In arithmetic, Monroe's Diagnostic Tests were given. Monroe's Tests were favored rather than Courtis's Standard Research Tests because the former are better for diagnostic measurement, and the latter for general measurement. In other words, the Monroe Tests are shorter, simpler, better graded, include several types of the fundamental operations, and show at a glance where the difficulties lie. There are twenty-one tests in all. Only seven were given to fifteen classes from the 4B to the 6B, inclusive. The first paper consisted of tests in the fundamental operations. The second test was reasoning. Below are the results of the tests in the fundamental operations given at the beginning of the term:

MEDIANS OF SPEED

GRADE	I	II	III	IV	V	VI
	Addition	Subtraction	Multipli- cation	Division	Addition	Division
6B1 .....	14	8	6	3	7	3
6B2 .....	16	7	6	3	8	3
6B3 .....	16	8	7	4	9	3
6A1 .....	13	7	6	3	8	3
6A2 .....	12	6	5	3	6	2
6A3 .....	13	7	5	2	6	2
5B1 .....	11	7	5	3	7	3
5B2 .....	10	5	5	2	6	2
5B3 .....	9	5	4	2	5	2
5A1 .....	10	6	5	2	6	2
5A2 .....	5	3	4	2	5	1
5A3 .....	8	4	4	1	5	2
4B1 .....	6	6	3	2	5	2
4B3 .....	7	7	3	2	5	2
4B2 .....	7	7	3	2	5	2



MEDIAN OF ACCURACY

GRADE	I	II	III	IV	V	VI
	Addition	Subtraction	Multiplication	Division	Addition	Division
6B1 .....	100%	75%	84%	67%	71%	67%
6B2 .....	100	100	84	100	75	67
6B3 .....	94	88	86	50	67	67
6A1 .....	100	100	84	33	75	67
6A2 .....	100	84	80	67	67	50
6A3 .....	100	86	80	50	67	100
5B1 .....	100	100	60	33	57	67
5B2 .....	100	100	80	0	67	0
5B3 .....	100	60	75	50	80	0
5A1 .....	100	67	80	50	67	100
5A2 .....	100	67	75	50	60	0
5A3 .....	100	50	50	0	60	0
4B1 .....	100	84	67	50	60	0
4B2 .....	86	57	34	0	60	0
4B3 .....	86	57	33	0	60	0

In interpreting the above, we find that in addition we have the best results. The poor results in subtraction, many teachers claim, are due to the Austrian method prescribed by the course of study. Other teachers claim that there is no uniformity in doing subtraction. Children coming from other schools perform the process in different ways. In multiplication, the pupils showed the need of drill in the tables. One teacher humorously said that long division was "a lost art" at the present day. The poor results in division were due to the fact that the pupils had not mastered the process of subtraction and were not sufficiently familiar with the multiplication tables.

The test in reasoning showed us that the children did fairly well in solving the principle involved, but failed in getting the correct answer. Here, again ample proof was given of weak work in the fundamental processes.

Teachers and pupils were very much interested in the results of the tests. The teachers found that the results of the measurements suggested to them economic methods in the learning and teaching process because the tests helped them to find individual differences in ability among the pupils. The results of the tests suggested changes in the grading of pupils. They pointed out to the teachers the effect of various factors in the learning and teaching process, and it was discovered that division could not be done unless the pupils could subtract and multiply. Above all, the conclusions were made the basis for securing improvement in the methods of teach-

ing and drilling when the results proved that the present method was unsatisfactory. The information derived from the tests, made the teachers consider the results and strive to improve their methods of instruction and drill according to the needs of the individual pupil. The teachers understood that the tests were for diagnostic purposes and were to show the ability and need of the pupils.

For the pupil himself the tests were a definite basis for discovering his ability: and, by keeping his own record from test to test, they furnished a powerful stimulus to the pupil to surpass his own previous attainments. The bright pupils were easily discovered and advanced. The backward pupils' difficulties were discovered and diagnosed and extra time and attention were given to them.

The tests gave new life to the schoolwork. The methods of presenting new work and drilling upon old material changed rapidly and effectively. The boys were playing a "new game" they told me. Every drill lesson was a "game" to them. They kept their own records, and a boy seemed to thoroughly enjoy competing with himself. This wave of enthusiasm continued to the end of the term. The Standardized Tests were given again and there was an improvement of one hundred percent in the fundamental operation and in the correct answers in the test in reasoning.

Below are the results of the January test in the fundamentals. The Standard Median Scores for speed and accuracy are also printed below:

MEDIANS OF SPEED

GRADE	I	II	III	IV	V	VI
	Addition	Subtraction	Multipli- cation	Division	Addition	Division
6B1 .....	21	14	12	7	8	7
6B2 .....	24	16	14	10	12	7
6B3 .....	24	14	10	7	12	5
6A1 .....	21	13	10	6	12	4
6A2 .....	19	13	9	4	9	4
6A3 .....	22	12	8	8	12	4
5B1 .....	19	21	8	8	7	9
5B2 .....	22	19	9	8	7	6
5B3 .....	16	14	6	3	5	5
5A1 .....	19	15	6	5	7	9
5A2 .....	17	15	7	7	6	3
5A3 .....	13	14	7	6	5	5
4B1 .....	16	13	6	5	4	6
4B2 .....	18	19	8	6	8	8
4B3 .....	12	8	6	4	8	5

## MEDIAN OF ACCURACY

GRADE	I	II	III	IV	V	VI
	Addition	Subtraction	Multipli- cation	Division	Addition	Division
6B1 .....	95%	86%	75%	100%	100%	71%
6B2 .....	100	75	71	60	75	71
6B3 .....	92	79	90	57	100	80
6A1 .....	95	77	90	67	67	75
6A2 .....	89	77	89	50	89	75
6A3 .....	82	91	100	88	58	75
5B1 .....	84	71	100	100	89	56
5B2 .....	95	84	78	63	100	50
5B3 .....	94	93	88	67	100	60
5A1 .....	95	93	100	60	86	44
5A2 .....	94	73	71	57	84	67
5A3 .....	92	71	71	67	100	100
4B1 .....	81	77	67	60	100	50
4B2 .....	89	74	88	84	75	75
4B3 .....	100	88	84	75	63	60

## STANDARD MEDIAN SCORES FOR SPEED

GRADE	IV	V	VI
Test I, .....	8.3	8.5	10.2
Test II, .....	4.4	5.3	7.1
Test III, .....	3.6	4.1	5.1
Test IV, .....	2.2	2.4	3.4
Test V, .....	4.2	4.5	5.3
Test VI, .....	2.4	2.8	3.5

## STANDARD MEDIAN SCORES FOR ACCURACY

GRADE	IV	V	VI
Test I, .....	100%	100%	100%
Test II, .....	68%	100%	100%
Test III, .....	62%	67%	79%
Test IV, .....	49%	56%	68%
Test V, .....	55%	59%	63%
Test VI, .....	44%	57%	74%

It has been found necessary to provide a means for the pupil to master these processes by himself. The Studebacker Exercises have been ordered for the fifteen classes. It is hoped that with their aid there will be a great improvement in the fundamental process. Experiments made have shown that a class with the special drill of the Studebacker Exercises made five times as much improvement as the class with regular class work.

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## EDITORIAL

**A** FAVORABLE indication for the progress of our civilization is the increasing interest in the subject of research. As Dr. Cattell has frequently pointed out, this country has been distinctly behind several countries in Europe in the amount of attention paid to research, in the number of men engaged in it, in the productivity of our investigators, and in the esteem in which they are held. The war has shown how vital is scientific investigation for the defense of the nation, and the National Research Council with its vigorous leaders and its considerable endowment gives promise of co-ordinating and vitalizing existing research agencies and giving rise to many others. It is true, as President Pritchett points out, much of the so-called research work is scarcely worthy of the name, but this fact only

emphasizes the need for more intensive effort, higher ideals of attainment, and more encouragement to productive activities.

In the field of education, as in most other fields of scientific endeavor, the universities have taken the lead, and the last decade has seen a remarkable development of interest in educational research in all the larger institutions of the country. More recently the encouragement of educational research has extended to city school systems, and perhaps twenty of the larger cities have made some provision for educational investigations. The National Association of Directors of Educational Research has already given a good account of itself through its Year Books, its published proceedings, and the enthusiastic and stimulating meetings which it has held in connection with the Department of Superintendence. A further evidence of its activity is the new *Journal of Educational Research*, the first number of which has just reached our desk. The new publication promises a greatly extended circle of influence for the Association, and bids fair to be a stimulating agency for the arousal of a still greater interest in educational research in the country-at-large. The editor-in-chief of the *Journal* is Professor B. R. Buckingham, of the University of Illinois, president of the Association during the past year. Connected with Professor Buckingham on the editorial staff are seven associate editors, each in charge of a special department, as follows: E. J. Ashbaugh, University of Iowa, secretary of the Association, in charge of the department devoted to the progress of the work of the Association; Leonard P. Ayres, Russell Sage Foundation, child accounting; W. W. Charters, Carnegie Institute of Technology, curriculum analysis and derivation; S. A. Curtis, director of educational research, Detroit, school supervision and research bureaus; Walter S. Monroe, University of Illinois, educational tests and measurements; George D. Strayer, Teachers College, Columbia University, educational finance, buildings and reports, and Lewis M. Terman, Stanford University, intelligence tests.

From this array of editorial talent there can be little doubt as to the excellence of the material that will be presented in the *Journal*. Further, as Professor Buckingham points out in his announcement, investigators in educational research have been so active during the past few years that there is at present available a greater amount of

really valuable material than can be accommodated in the established journals. The first number contains an excellent survey of the field of educational research by S. A. Courtis and P. C. Packer; a discussion of the use of intelligence tests in the grading of school children by Lewis M. Terman; a description of a true-false examination test applied to geographical material by William A. McCall; and an account of a series of calibrated objective tests in first year algebra by Murray A. Delman. We augur for the undertaking a future of great influence and usefulness.

J. C. BELL.

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## NOTES AND NEWS

Dr. Roswell P. Angier, professor of psychology at Yale University, has been appointed to the newly-established deanship of the common freshman year.

At the meeting of the American Association for the Advancement of Science at St. Louis Professor Charles H. Judd, director of the school of education at the University of Chicago, was elected vice-president and chairman of the section of education.

Dr. Frank Ellsworth Spaulding, superintendent of schools at Cleveland, has been appointed head of the new department of education of the Yale Graduate School. Dr. Spaulding will begin his new work in September.

Dr. James Crosby Chapman, associate professor of experimental education at Western Reserve University, has been elected assistant professor of educational psychology in the graduate school of Yale University.

Miss Elsie Seyfarth, who has been giving educational and intelligence tests under the direction of the Educational Clinic of the College of the City of New York, has been appointed director of special classes for the State of Wyoming.

The proposal of the Federal Commission of Education to establish at the University of Wisconsin a research station in education has been approved by the Board of Regents. Professor V. A. C. Henman, director of the School of Education, has been designated director of the station, with Professor M. V. O'Shea and F. L. Clapp, as special collaborators.



On December 24, 1919, the trustees of the Rockefeller Foundation announced the receipt of a gift from Mr. John D. Rockefeller of fifty million dollars. In transmitting the gift Mr. Rockefeller specifically authorized the trustees to utilize both principal and income for any of the corporate purposes of the Foundation which, as stated in the charter, are "to promote the well-being of mankind throughout the world." While imposing no restriction upon the discretion of the trustees, Mr. Rockefeller in his letter of transmittal expressed special interest "in the work being done throughout the world in combatting disease and in promoting scientific research."

At the meeting of the New York Society for the Experimental Study of Education held January 16th, the general topic of discussion was "Tests of Intelligence in the Schools." The following brief papers were presented: "Mental Ability of Undernourished Children," David Mitchell; "The National Research Council's Intelligence Tests for School Children," Truman Lee Kelley; "Classification of Second-Grade Children According to Ability," Francis N. Maxfield; "The Use of the Pressey Primary Tests with First, Second and Third-Grade Children," J. Carleton Bell; "The Use of the Otis Intelligence Tests with Fifth- and Eighth-Grade Children," Stephen F. Bayne; "The Significance of Some Intelligence Tests Given to 8-B Pupils," Egbert M. Turner.

The Hamburg Psychological Laboratory, under the direction of William Stern, is publishing a series of "Studies in Mental Capacity" (*Hamburger Arbeiten zur Begabungsforschung*) through the firm of Johann Ambrosius Barth, Leipzig. The first three studies of the series are now ready. Number 1 is entitled "The Selection of Gifted Elementary School Pupils in Hamburg" (*Die Auslese befaehigter Volksschueler in Hamburg*), and the psychological report is by H. Peter and W. Stern. Number 2 includes a number of "Studies in the Intelligence of Children and Adolescents" (*Untersuchungen ueber die Intelligenz der Kinder und Jugendlichen*). Number 3, which has just appeared, is entitled "A Summary of Methods for Testing the Intelligence of Children and Adolescents" (*Methodensammlung zur Intelligenzpruefung von Kindern und Jugendlichen*) by W. Stern and O. Wiegmann, and contains a complete, systematic catalogue of all the testing methods that have thus far been published. This study will be well-nigh indispensable for teachers interested in mental testing. In addition to this series the Hamburg Laboratory is now publishing through the same firm the widely used "Psychological Observation Blanks for School

Children" (Psychologischen Beobachtungsbogen fuer Schueler). These blanks will no longer be obtainable from the Laboratory, as heretofore, but are to be ordered directly from the publishers.

The Carnegie Corporation of New York has announced its purpose to give five million dollars for the use of the National Academy of Sciences and the National Research Council. It is understood that a portion of the money will be used to erect in Washington a home of suitable architectural dignity for the two beneficiary organizations. The remainder will be placed in the hands of the Academy, which enjoys a federal charter, to be used as a permanent endowment for the National Research Council. This impressive gift is a fitting supplement to Mr. Carnegie's great contributions to science and industry. The Council is a democratic organization based upon some forty of the great scientific and engineering societies of the country, which elect delegates to its constituent divisions. It was organized in 1916 as a measure of national preparedness and its efforts during the war were mostly confined to assisting the government in the solution of pressing war-time problems involving scientific investigation. Reorganized since the war on a peace-time footing, it is now attempting to stimulate and promote scientific research in agriculture, medicine and industry, and in every field of pure science. The war afforded a convincing demonstration of the dependence of modern nations upon scientific achievement, and nothing is more certain than that the United States will ultimately fall behind in its competition with the other great peoples of the world unless there be persistent and energetic effort expended to foster scientific discovery. The American Psychological Association is one of the societies represented on the Council, and psychologists have taken a prominent part in its investigations. It is to be expected, therefore, that psychology, and particularly psychology as applied to education, business and the professions, will share liberally in the benefits of this endowment.

## PUBLICATIONS RECEIVED

MICHAEL WEST. *Education: Selective, Specific, Compensatory*. New York: Longmans, Green and Co., 1917. Pp. viii, 223. \$1.25.

The author, who is a member of the Indian Educational Service, gives a good picture of educational conditions in India, especially in Bengal, and makes valuable, constructive suggestions for educational improvement. The first part of the book is general in its nature, and deals with the problem of educational values. Chapter I, Specific Education, criticises certain features of English education, particularly the effort to select by means of examinations the best boys for advancement to higher courses. Specific, or vocational, education tends to produce a stratified condition of society in which industrialism is magnified at the expense of all other aims. A compensatory education is urged in which the aim is the development of those aspects of physical and mental make-up in which the individual is deficient. This presupposes an accepted standard of the perfect individual, and the possibility of rounding out deficiencies by an educative process,—assumptions that are of questionable validity. There is frequent reference to Dewey, McDougall, Hobhouse, Bergson and Freud, but modern scientific studies in education are ignored.

WALTER NEWELL WESTON. *Intuition: Its Office, Its Laws, Its Psychology, Its Triumphs and Its Divinity*. New York: Goodyear Book Concern, 1918. Pp. 186. \$1.50.

This is not a scientific book, but rather a series of anecdotes designed to establish the existence of a mysterious faculty of intuition, as contrasted with and superior to a rational reflection. The corollary is that these mystical promptings should be heeded and acted upon no matter how unreasonable they may seem. While the book is doubtless well meant, the result of such teachings is essentially vicious and destructive of all principle. In this age of the more or less unconscious obfuscation even of the intelligent it is necessary to stand firmly for the primacy of rational, clear-headed thinking, rather than throw a sop to blind emotion.



GUY MONTROSE WHIPPLE. *Experiments in the Education of Gifted Children*. Reprinted from the Michigan Schoolmasters' Club Journal, March, 1918. Pp. 16.

A stimulating and forceful discussion of the problem of the gifted child in the school. The author describes some striking cases from the literature of precocious children, and takes up one by one the questions that come before a principal or superintendent regarding the treatment of the brighter five to ten percent of the school children. While recognizing the value of special training, the author stresses the necessity of exploring the native intelligence of the child as a prerequisite for sound educational procedure. The discovery and development of special talent is most desirable, but so difficult that "the day of vocational guidance by mental tests is not so near as many would have us believe. In answer to the question whether gifted pupils should pursue the regular curriculum at a faster pace, or extend their work to secure a more intensive and a more extensive training, the author inclines to the view that many high school subjects might profitably be taken up at an early age, but it is doubtful whether the bright child should be pushed ahead into classes made up chiefly of older children. There is an interesting account of an experiment carried out with gifted children in Urbana, Illinois.

GUY MONTROSE WHIPPLE. *Classes for Gifted Children*. Bloomington, Illinois: Public School Publishing Company, 1919. Pp. 151.

This book is the outcome of a grant from the General Education Board for the investigation of the question "What mental tests are most valuable in selecting from ordinary public school classes bright pupils for training in special classes for gifted children?" The earlier chapters contain an account of the experiment as a whole, and the description of the ten individual tests, the twenty-five group tests, and the twenty educational tests used in the investigation. With the account of each test here is a brief statement of its outcome with the Special Group and with the Control Group of the investigation. Those who are interested in the evaluation of mental tests for school purposes will do well to study this discussion carefully. Chapter V deals with individual differences in the mentality of the pupils in the special group. These pupils had been selected by teachers on the basis of general impression as to school brightness, but some of them proved to be no brighter than the control group by the mental tests. One of the most striking results of the

experiment is the demonstration of the superiority of a battery of mental tests over the individual judgment of teachers in picking out those pupils who are genuinely gifted. The "ability profiles" as expressed in percentile rank in each test show the widest variation in individual attainments, as in emotional attitude and in ambition. The final criterion of the value of mental tests for classification is whether the pupils denominated bright by mental tests do conspicuous work in school and those counted dull do poor work. A detailed analysis of the school progress of the children furnishes a vindication of the claims of mental tests. In only two or three cases was there any disagreement in the outcome. On the basis of the experiment a battery of six tests is especially recommended for the selection of gifted children. These require a working time of 111 minutes, or approximately two hours. The final chapter contains an analytical study of talent in drawing. The problem was to determine what psychical traits are significant for superior skill in drawing and how may these traits be best diagnosed by tests. Owing to the great complexity of drawing ability and to the lack of previous experimental analysis the outcome of the study was largely negative, *i. e.* none of the tests could be said to furnish clear indications of drawing ability. There is a valuable annotated bibliography on talent in drawing, and a very serviceable one on gifted children.

EVA W. WHITE. *Household Arts*. Survey of the Gary Public Schools. New York: General Education Board: 1918. Pp. xix, 49. Ten cents.

This is a study of cooking and sewing in the Gary Schools. In both subjects there is an examination of the time scheduled, the staff and the instruction, and the application of various practical tests. Some of the latter were passed creditably, but on the whole there was a laxity and lack of earnestness about the work which the surveyor sharply criticizes.

J. HAROLD WILLIAMS. *Exceptional Children in the Schools of Santa Ana, California*. Whittier State School, Department of Research, Bulletin No. 6, 1918. Pp. 40.

The 1913 pupils of the Santa Ana schools were tested in height, vision, grip, intelligence (a few cases), logical memory (in two schools), opposites, spelling (Ayres scale), writing (Thorndike scale), and arithmetic (Starch reasoning). In the three school subjects the pupils tested distinctly below the norms obtained from other places.

## THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

### The Measurement of Ability in Latin— Part III. Vocabulary and Sentence Tests

V. A. C. HENMON

*The University of Wisconsin.*

In two previous papers,<sup>1</sup> investigations were reported resulting in five standardized vocabulary tests and three sentence tests for measuring progress and ability in Latin. The vocabulary tests were based on 239 words common to thirteen first-year books and to Caesar, Cicero and Vergil. It was pointed out that, in addition to these words, there were 80 other words common to the first-year books, but not found in the vocabularies of all three writers. The sentence tests were derived from 44 sentences containing none but words in the standard list. It was noted in the case of the sentences that some of them did not grade up by uniform steps, that some showed an inversion in the third year, and that it would be necessary to experiment with a much larger number of sentences before an entirely satisfactory sentence scale or test could be constructed.

The present paper supplements the earlier studies by giving scale values for the eighty additional words and for sixty additional sentences.

#### VOCABULARY TEST

A blank containing the list of eighty words arranged alphabetically was printed and given in fourteen schools distributed in six states. The blank is not reproduced but the list as given appears in Table II below. Table I gives the median number of words correctly translated and the number of pupils in each school and in each year.

The noteworthy features of this table are, as shown in all tests of this character, the wide variations in schools and in pupils. The contrast between School G with a median score of 31 words in the first year and School H with a score of 78 words is especially

<sup>1</sup>Jour. of Educ. Psychology, Nov. and Dec. 1917.



TABLE I—VOCABULARY TEST

SCHOOL	MEDIAN				NUMBER OF PUPILS			
	I	II	III	IV	I	II	III	IV
A	60	65	59	60	44	35	10	4
B	60	64	77	72	13	8	3	
C		66				23		
D	50	53	50	55	44	30	19	11
E	50	55	70	77	27	8	3	3
F	51	59	58	62	44	33	19	9
G	31	52			56	21		
H	78	76	74	74	27	21	14	13
I	55	45	48	56	46	29	6	6
J	46	54	61		19	14	3	1
K	50	58	63	67	13	21	8	11
L	42				5			
M	38	48			18	10		
N			69	68			13	8
	51	59	63	67	356	253	98	72
Range	11-79	14-90	32-79	32-80				

striking. The wide variation among pupils appears in the range, but is indicated more strikingly by the fact that the median score of the upper tenth of the first year is 77 words, while the median of the lower tenth is 25 words. The range from 11 to 79 is not due, therefore, to very exceptional cases. The variability in the second, third, and fourth years is almost as marked as in the first year, and there is the now familiar overlapping of the distribution curves.

The purpose of this study is the determination of the weights or values to be assigned to each word for each year and a general scale value for all four years. Table II gives the essential information for these determinations and the scale values that have been derived.

The method of determining the scale values has been described in detail in the earlier papers. The method in substance consists of locating each word on the base line of a normal surface of frequency in terms of the probable error equivalents of the percentages of times it is correctly translated. This is the first step. In order to eliminate minus values an approximation to a zero point of ability was arbitrarily taken by locating the position of a word so easy that it would be missed by but 5 out of 1000 first year pupils. This point is located 3.8 P. E. below the median. The scale value for each word was then determined by subtracting from or adding to -3.8

TABLE II

	Percents Correct				Scale Values				General Scale Values
	I	II	III	IV	I	II	III	IV	
aeriter, .....	47.7	61.7	61.2	62.5	3.9	3.4	3.4	3.3	3.5
agmen, .....	38.5	49.4	45.9	63.8	4.2	3.8	4.0	3.3	3.8
amicitia, .....	62.3	81.8	80.6	81.9	3.3	2.5	2.5	2.4	2.7
animal, .....	91.3	91.3	93.8	94.4	1.8	1.8	1.5	1.4	1.6
bene, .....	79.2	83.0	94.9	100.0	2.6	2.4	1.4	.0	1.6
captivus, .....	82.5	86.6	89.8	84.7	2.4	2.2	1.9	2.3	2.2
celeritas, .....	43.5	59.3	74.5	80.6	4.0	3.5	2.8	2.5	3.2
celeriter, .....	58.4	71.5	74.5	70.8	3.5	3.0	2.8	3.0	3.1
eivitas, .....	83.4	76.7	76.5	88.3	2.4	2.7	2.7	2.4	2.6
collis, .....	73.3	92.5	86.7	90.3	2.9	1.7	2.2	1.9	2.2
convoco, .....	60.4	72.3	85.7	73.6	3.4	2.9	2.2	2.9	2.6
cornu, .....	75.8	72.7	74.5	81.9	2.8	2.9	2.8	2.4	2.7
decimus, .....	47.7	57.7	63.2	66.7	3.9	3.5	3.3	3.2	3.5
dissimilis, .....	77.2	80.6	92.8	90.3	2.7	2.5	1.6	1.9	2.2
ducenti, .....	34.8	60.5	43.9	43.1	4.4	3.4	4.0	4.1	4.0
duodecim, .....	76.9	87.7	87.7	83.3	2.7	2.1	2.1	2.4	2.3
equitatus, .....	53.1	74.7	76.5	63.8	3.7	2.8	2.7	3.3	3.1
equus, .....	76.7	89.7	90.8	95.8	2.7	1.9	1.8	1.3	1.9
expugno, .....	32.3	69.2	60.2	62.5	4.5	3.1	3.4	3.3	3.6
facile, .....	39.9	74.3	71.4	75.0	4.2	2.8	3.0	2.8	3.2
filia, .....	88.5	93.7	97.9	97.2	2.0	1.5	.8	1.0	1.3
flumen, .....	99.1	99.6	98.9	98.1	.3	.0	.4	1.6	.6
fortiter, .....	62.0	84.5	89.8	86.1	3.3	2.3	1.9	2.2	2.4
fossa, .....	82.3	96.8	75.5	66.7	2.4	1.1	2.8	3.2	2.4
frumentum, ..	94.4	99.2	97.9	96.8	1.4	.2	.8	1.3	.9
gladius, .....	73.9	85.3	88.7	88.9	2.9	2.3	2.0	2.0	2.3
incolo, .....	43.5	70.7	46.9	77.8	4.0	3.0	3.9	2.7	3.4
intellego, .....	42.1	78.7	94.9	91.7	4.1	2.6	1.4	1.7	2.5
interficio, .....	66.6	87.3	90.8	81.9	3.2	2.1	1.8	2.4	2.4
iste, .....	59.8	51.4	81.6	86.1	3.4	3.7	2.5	2.2	3.0
itaque, .....	53.1	92.5	97.9	94.4	3.7	1.7	.8	1.4	1.9
legatus, .....	84.6	93.7	87.7	94.4	2.3	1.5	2.1	1.4	1.8
legio, .....	78.4	87.3	66.3	62.2	2.6	2.1	3.2	3.3	2.8
liber, .....	84.0	68.0	82.6	87.4	2.3	3.1	2.4	2.1	2.5
liberi, .....	68.5	75.1	75.5	81.9	3.1	2.8	2.8	2.4	2.8
libero, .....	58.1	60.8	82.6	93.1	3.5	3.4	2.4	1.6	2.7
magis, .....	23.3	30.0	44.9	54.2	4.9	4.6	4.0	3.6	4.3
maxime, .....	36.5	39.0	50.0	41.7	4.3	4.2	3.8	4.1	4.1
minor, .....	59.3	56.9	56.1	79.2	3.5	3.6	3.6	2.7	3.4
minus, .....	33.7	49.4	61.2	62.5	4.5	3.8	3.4	3.3	3.8
mons, .....	86.5	91.3	87.7	87.4	2.2	1.8	2.1	2.1	2.1
moror, .....	34.0	48.6	39.8	80.6	4.4	3.9	4.2	2.5	3.8
multitudo, ...	86.5	94.4	94.9	94.4	2.2	1.4	1.4	1.4	1.6
natura, .....	63.2	81.8	84.7	81.9	3.3	2.5	2.3	2.4	2.6
nolo, .....	45.8	60.1	65.3	66.7	4.0	3.4	3.2	3.2	3.5
numen, .....	1.4	3.5	10.2	50.0	7.1	6.5	5.7	3.8	5.8
obses, .....	46.6	61.3	65.3	66.7	3.9	3.4	3.2	3.2	3.4
oppidum, .....	94.7	98.4	96.9	94.4	1.4	.6	1.2	1.4	1.2
optimus, .....	60.7	59.3	68.3	75.0	3.4	3.5	3.1	2.8	3.2
passus, .....	51.7	53.3	52.0	47.2	3.7	3.7	3.7	3.9	3.8
persuadeo, .....	95.2	97.2	100.0	100.0	1.3	1.0	.0	.0	.6
pes, .....	66.6	77.1	81.6	83.3	3.2	2.7	2.5	2.4	2.7
plurimus, .....	58.7	51.8	62.2	59.7	3.5	3.7	3.3	3.4	3.5
plus, .....	58.1	57.7	77.5	81.9	3.5	3.5	2.7	2.4	3.0
pons, .....	76.7	96.4	98.9	98.6	2.7	1.1	.4	.5	1.2
porto, .....	75.8	73.1	81.6	90.3	2.8	2.9	2.5	1.9	2.5
prope, .....	24.1	50.2	65.3	77.8	4.8	3.8	3.2	2.7	3.6
provincia, .....	94.7	97.2	98.9	98.6	1.4	1.0	.4	.5	.8
proximus, .....	50.0	57.3	68.3	73.6	3.8	3.5	3.1	2.9	3.3
quidam, .....	42.4	26.1	45.9	37.5	4.1	4.7	4.0	4.3	4.3
quinque, .....	57.6	44.2	45.9	44.4	3.5	4.0	4.0	4.0	3.9
quo, .....	23.0	31.6	39.8	68.1	4.9	4.5	4.2	3.1	4.2
reliquus, .....	58.7	92.9	86.7	94.4	3.5	1.6	2.2	1.4	2.2
ripa, .....	62.1	75.5	59.2	73.6	3.3	2.8	3.5	2.9	3.1
septem, .....	90.7	95.7	98.9	100.0	1.8	1.3	.4	.0	.9
septimus, .....	67.7	81.0	86.7	93.1	3.1	2.5	2.2	1.6	2.6
sex, .....	88.2	95.7	95.9	91.7	2.0	1.3	1.2	1.7	1.6
silva, .....	89.6	97.2	97.9	97.2	1.9	1.0	.8	1.0	1.2
statim, .....	46.9	61.3	70.4	80.5	3.9	3.4	3.0	2.5	3.2
sub, .....	77.8	90.1	91.8	97.2	2.7	1.9	1.7	1.0	1.8
summus, .....	60.1	67.6	73.4	77.8	3.4	3.1	2.9	2.7	3.0
superior, .....	74.7	83.8	84.7	88.9	2.8	2.3	2.3	2.0	2.6
sustineo, .....	76.4	94.9	94.9	83.3	2.7	1.4	1.4	2.4	2.0
trans, .....	87.9	95.3	97.9	100.0	2.1	1.3	.8	.0	1.1
transeo, .....	65.2	91.7	97.9	98.6	3.2	1.7	.8	.5	1.6
ultimus, .....	29.2	37.2	61.2	76.4	4.6	4.3	3.4	2.7	3.8
uter, .....	21.9	22.5	28.6	40.3	5.0	4.9	4.6	4.2	4.7
vester, .....	44.4	42.3	87.7	81.9	4.0	4.1	2.1	2.4	3.2
viginti, .....	68.5	79.4	77.5	86.1	3.1	2.6	2.7	2.2	2.7
vulnero, .....	72.8	88.1	95.9	94.4	2.9	2.1	1.2	1.4	1.9
					258.8	215.2	196.5	183.7	214.7

P. E. the P. E. equivalents of the percentages of times it was correctly translated. Thus in Table II *acriter* was correctly translated by 47.7% of first year pupils. The P. E. equivalent found by consulting tables of P. E. values corresponding to given percents of the normal surface of frequency<sup>2</sup> is +.085 above the median. This value added to -3.8 P. E. gives 3.885 or 3.9, the assigned value. The same procedure was followed in determining the scale values for the other years. The derivation of the general scale value requires the determination of the size of the intervals between the medians of the successive years which, in turn, involves the amount and percentage of overlapping between the different years. Table III gives the facts.

TABLE III  
NUMBER AND PERCENT. OF PUPILS REACHING OR EXCEEDING THE MEDIAN  
OF EVERY OTHER YEAR.

		I	II	III *	IV
I	Number, .....		111	80	56
	Percent, .....		31.1	22.4	15.7
	P. E., .....		+ .731	+ 1.125	+ 1.493
II	Number, .....	185		100	64
	Percent, .....	73.1		39.5	25.3
	P. E., .....	- .913		+ .395	+ .986
III	Number, .....	76	60		40
	Percent, .....	77.5	61.2		40.8
	P. E., .....	- 1.120	- .422		+ .345
IV	Number, .....	63	49	41	
	Percent, .....	87.5	68.0	57.0	
	P. E., .....	- 1.706	- .693	- .261	

From this table were obtained the various direct and derived values of the intervals between the first year median and the other years. The method is given in the earlier papers and is not repeated here. The intervals between the years, using six direct and derived intervals and giving the direct intervals a weight of 6 and the derived intervals involving skipping of one or two steps, weights of 4 and 2, respectively, are as follows:

$$\begin{array}{ccc}
 M_1 - M_2 & M_2 - M_3 & M_3 - M_4 \\
 .775 \text{ P. E.} & .394 \text{ P. E.} & .374 \text{ P. E.}
 \end{array}$$

<sup>2</sup>BUCKINGHAM, B. R. *Spelling Ability—Its Measurement and Distribution*, 1913, p. 116.



When referred to the first year median, the intervals between it and the third and fourth years are:

$$\begin{array}{rcl} M_1 - M_3 & & M_1 - M_4 \\ 1.169 \text{ P. E.} & & 1.543 \text{ P. E.} \end{array}$$

The intervals between the various years thus being known, the general scale value is obtained by adding to the various P. E. values for each word the intervals at which the medians of each year stand above the first year, viz. .775, 1.169, 1.543. The average of the values thus obtained gives the average position of the word when referred to the first year median. To eliminate minus values the average position of the arbitrarily assumed zero point, when this is referred to the first year median by adding as before .775, 1.169, and 1.543 respectively, was obtained and taken as the point of reference. This average position is  $-2.947$ . The average position of each word when referred to this point of reference by subtraction from, or addition to it, gives the basis for the general scale value indicated in the Table.

This list of words is much less satisfactory for testing purposes than the vocabularies reported in the earlier study. A very considerable number of the words occur frequently in Caesar, but seldom, if ever, are they used in Cicero or Vergil. The result is that some of the words are translated correctly more frequently in the first or second years than in the third or fourth years. Notable examples are *fossa*, *flumen*, *legio*, and *passus*. Many words show such inversions in the third year. Moreover, few of the words, even if they do not show inversions, grade up at all uniformly.

It is interesting to note the difference between the year medians with this list and with the earlier list of 239 words. The difference between the first year and the second year by the earlier list was found to be 1.541 P. E. while by this list it is .775 P. E. The differences between the second and third and the third and fourth years by the earlier list were 1.281 P. E. and .465 P. E., while for the later list the intervals are .394 P. E. and .374 P. E. The greater variability in frequency of occurrence accounts for these differences.

Omitting from the list those words which are so easy as to be missed by third or fourth year pupils, such as *bene*, *persuadeo*, *septem* and *trans*, those where an English derivative makes the translation obvious, such as *animal*, *captivus*, *minor*, *minus*, and *multitudo*,

the numerals, and those words showing marked inversions or irregularities, there remains a list of 50 fairly satisfactory words. This list, which may be added as Test E to the four previously constructed, appears below with the words arranged in order of difficulty and with the corresponding scale values.

Latin Vocabulary Test E

silva .....	1.2	liberi .....	2.8
pons .....	1.2	summus .....	3.0
filia .....	1.3	plus .....	3.0
transeo .....	1.6	iste .....	3.0
legatus .....	1.8	celeriter .....	3.1
sub .....	1.8	ripa .....	3.1
equus .....	1.9	celeritas .....	3.2
vulnero .....	1.9	optimus .....	3.2
itaque .....	1.9	statim .....	3.2
sustineo .....	2.0	vester .....	3.2
mons .....	2.1	proximus .....	3.3
collis .....	2.2	obses .....	3.4
reliquus .....	2.2	nolo .....	3.5
gladius .....	2.3	plurimus .....	3.5
interficio .....	2.4	acriter .....	3.5
fortiter .....	2.4	prope .....	3.6
porto .....	2.5	expugno .....	3.6
intellego .....	2.5	ultimus .....	3.8
liber .....	2.5	moror .....	3.8
convoco .....	2.6	maxime .....	4.1
civitas .....	2.6	quo .....	4.2
septimus .....	2.6	magis .....	4.3
pes .....	2.7	quidam .....	4.3
amicitia .....	2.7	uter .....	4.7
libero .....	2.7		
cornu .....	2.7		
			140.7

Standard June scores with this test, in terms of the number correct, percents correct, and the sum of the scale values, would be as follows:

	I	II	III	IV
Number correct .....	29	35	38	40
Percents correct .....	58	70	76	80
Sum of scale values .....	77	91	101	108

SENTENCE TESTS

Sixty sentences, arranged in four sets of fifteen each, were selected or constructed, using in them none but words found in the list of 239 words common to vocabularies of high school Latin. The sentences were as follows:

*Latin Sentence Test (1)*

1. Eques fortis est .....
2. Dux filio telum dedit .....
3. Hi pueri exercitum hostium viderunt .....
4. Scimus ubi hae res sint .....
5. Copiae auxilio amicis missae sunt .....
6. In hoc loco castra ponere non possumus .....
7. Quorum adventu spes matri meae erit .....
8. Milites magna cum virtute urbem oppugnabant .....
9. Patrem fortiozem filio esse dicent .....
10. Hoc proelio facto copias in fines suos ducit. ....
11. Hoc faciemus ut domum sine iniuria veniat .....
12. Eius frater veritus est ne opus difficilius esset .....
13. Si hostes vincant, fines nostros relinquamus et alias domos  
petamus .....
14. Eo cum venisset principes ad se duci iussit .....
15. Pacis faciendae causa homines ex his urbibus a senatu appellati  
erant .....

*Latin Sentence Test (2)*

1. Muri urbis alti erant .....
2. Amicus meus servos bonos habet .....
3. Miles tibi telum dabit .....
4. Dies tres exercitui praeerat .....
5. Tertio anno belli vincemus .....
6. Dixit se urbem oppugnaturum esse .....
7. Eques magno cum periculo ducis vitam defendit .....
8. Consul cum decem milibus equitum in fines hostium profectus est
9. Rogamus ut pax cum finitimis nostris sit .....
10. Nemo est qui pugnare quam pacem habere malit .....
11. Viam facimus quo facilius eos sequamur .....
12. In imperatore deligendo magna virtus petenda est .....
13. Res tuae ita secundae erant ut ab dis auxilium non peteres ....
14. Cum omnia incensa sint domi nihil est quo vitam tenere possint
15. Hoc consilium belli gerendi causa cum finitimis suis fecit .....



*Latin Sentence Test (3)*

1. Exercitus est magnus .....
2. Mors homines superat .....
3. Eum ire iussit .....
4. Undique pugnatum est .....
5. Bellum decem annos gesserant .....
6. Nihil erat reliqui .....
7. Prima luce proelium ab hostibus commissum est .....
8. Milites urbi auxilio erunt .....
9. Dixit se nuntium pacis fuisse .....
10. Nunc rogas quid facere possim .....
11. Equites contenderunt ut quam primum domum pervenirent ....
12. Si telum coniciat periculum sit .....
13. Vereor ne frater eius malus sit .....
14. Locus castris muniendis facilis nobis deligendus est .....
15. Si armis uti potuisset, non profectus esset .....

*Latin Sentence Test (4)*

1. Puer in agro est .....
2. Milites ex castris ducit .....
3. Eos tribus diebus in hoc loco videbimus .....
4. Urbs ab exercitu diu occupata est .....
5. Ad quem eius pater nuntium misit .....
6. Poteritne in eam partem urbis impetum facere? .....
7. Alii proelium relinquunt, alii magna cum virtute pugnant ....
8. Incendite domos vestras et iter nobiscum facite .....
9. His rebus cognitis, totus exercitus prima luce discesserunt ....
10. Multi undique venerunt ut pacem ab illo duce peterent .....
11. Equites tam celeres sunt ut nostri eos sequi non possint .....
12. Hoc bellum nobis maxima cum virtute gerendum est si vincere  
volumus .....
13. Nuntius profecturus, amicis de itinere nihil dixit .....
14. Urbs, quae eo tempore non munita est, facile capta est .....
15. Cui nos qui superati sumus arma nostra tradimus? .....

These sets, in whole or in part, were given in eleven schools, distributed in five states. Table IV gives the median scores in each test and the number of pupils taking them.

The same wide range of abilities as appeared in the vocabulary test is shown in translating these sentences.

SENTENCE TEST 1									SENTENCE TEST 2								
SCHOOL	Medians				No. of Pupils				SCHOOL	Medians				No. of Pupils			
	I	II	III	IV	I	II	III	IV		I	II	III	IV	I	II	III	IV
B	7				13				B		7	10	9		8	3	7
D	4	6	6	7	34	33	17	11	D	3	5	7	7	36	36	17	12
E	1	3.5	7	9	30	8	3	3	E	1	2.5	5	9	28	8	3	3
F	3	6	9	10	44	35	19	9	F	2	5	8	11	19	29	17	8
I	6	3	9	9	47	27	7	6	I	3	2	3.5	6.5	45	29	6	6
J	3	7.5	9		18	14	3	1	J	2	5.5	9		18	14	3	1
K	5	8	12	10	13	21	8	11	K	3	9	12	9	16	20	8	11
L	0				4				L	0				6			
M	2	5			19	9			M	1	1			19	9		
N			14	12			13	5	N			12	13			14	7
O	5	5			13	5	2		O		4				5	2	
	4	6	9	10	235	152	72	46		2	5	8	9	187	158	73	36

SENTENCE TEST 3									SENTENCE TEST 4								
SCHOOL	Medians				No. of Pupils				SCHOOL	Medians				No. of Pupils			
	I	II	III	IV	I	II	III	IV		I	II	III	IV	I	II	III	IV
B		8	9	7		6	3	6	B			10	12.5			3	6
E	2	5	5	7	26	8	3	3	E	2	4	6	12	27	8	3	3
F		8	9.5	10.5		15	12	4									
I	4	4.5	7	7	49	26	7	7	I	5	5	6	11.5	48	30	5	6
J	2.5	5.5	7		18	14	3	1	J	3	8	13		16	15	3	1
K	3	8	10.5	9	17	21	8	11	K	3.5	10	14	10	16	21	6	11
L	1				5				L	1				5			
M	3	6			19	9			M	3	6			19	9		
N			12	11			15	7	N				14				23
O	5				13		2		O					13		2	
	3	7	10	10	147	99	53	39		3	6	10	13	144	83	22	50

Table V gives the percents of times each sentence is translated correctly and the scale values derived.

In deriving the scale values for each year and the general scale value the same method was employed as was used in the case of the vocabularies. For the general scale value the intervals between the year medians were determined as before. The long, detailed tables necessary for this purpose are omitted and the procedure is not described again. The forty-four sentences scaled in the earlier study had been referred to the position of the easiest sentence instead of the average position of 3.8 P. E., the arbitrarily assumed zero-point of ability in Latin. In order to refer the vocabularies and

TABLE V

Sentence Test		Percents Correct				Scale Values				General Scale
		I	II	III	IV	I	II	III	IV	
I	1	45.1	52.6	79.1	73.9	4.0	3.7	2.6	2.9	3.3
	2	57.0	66.5	83.3	87.0	3.5	3.2	2.4	2.1	2.8
	3	51.5	65.8	81.9	80.4	3.7	3.2	2.4	2.5	3.0
	4	29.4	32.2	80.2	89.1	4.6	4.5	2.5	2.0	3.4
	5	25.5	42.1	61.1	56.5	4.8	4.1	3.4	3.6	4.0
	6	54.9	69.1	88.9	97.8	3.6	3.1	2.0	.8	2.4
	7	3.4	22.4	59.7	60.9	6.5	4.9	3.4	3.4	4.6
	8	70.6	79.6	79.1	80.4	3.0	2.6	2.6	2.5	2.7
	9	4.9	6.6	23.6	15.2	6.3	6.0	4.9	5.3	5.6
	10	16.2	66.5	59.7	60.9	5.3	3.2	3.4	3.4	3.8
	11	5.1	14.5	33.3	34.8	6.2	5.4	4.4	4.4	5.1
	12	2.1	11.8	33.3	23.9	6.8	5.6	4.4	4.9	5.4
	13	6.4	15.8	38.9	43.5	6.1	5.3	4.2	4.0	4.9
	14	.4	26.3	47.2	43.5	7.6	4.7	3.9	4.0	5.1
	15	1.7	26.3	59.7	50.0	6.9	4.7	3.4	3.8	4.7
						78.9	64.2	49.9	49.6	60.8
II	1	59.4	67.7	59.0	78.2	3.4	3.1	3.5	2.7	3.2
	2	47.1	62.7	79.5	72.7	3.9	3.3	2.6	2.9	3.2
	3	21.9	23.4	57.5	65.4	5.0	4.9	2.5	3.2	4.2
	4	31.0	46.8	50.7	63.6	4.5	3.9	3.8	3.3	3.9
	5	9.6	18.4	30.1	52.7	5.7	5.1	4.6	3.7	4.8
	6	16.6	40.5	63.0	63.6	5.2	4.2	3.3	3.3	4.0
	7	27.8	36.7	80.8	61.8	4.7	4.3	2.5	3.4	3.7
	8	13.9	49.4	63.0	61.8	5.4	3.8	3.3	3.4	4.0
	9	10.7	36.1	74.0	56.4	5.6	4.3	2.8	3.6	4.1
	10	5.3	36.1	72.6	78.2	6.2	4.3	2.9	2.7	4.0
	11	5.3	32.5	53.4	47.3	6.2	4.5	3.7	3.9	4.6
	12	.5	15.2	50.7	61.8	7.6	5.3	3.8	3.4	5.0
	13	.0	3.8	31.5	52.7	7.6	6.4	4.5	3.7	5.6
	14	.0	5.7	31.5	23.6	7.6	6.1	4.5	4.9	5.8
	15	5.3	22.2	50.7	47.3	6.2	4.9	3.8	3.9	4.7
						84.8	68.4	49.6	52.0	60.8
III	1	83.7	97.0	98.1	89.7	2.3	1.0	.7	1.9	1.5
	2	40.8	44.4	71.7	59.0	4.1	4.0	2.9	3.5	3.6
	3	23.8	65.7	90.6	89.7	4.9	3.2	1.8	1.9	3.0
	4	29.4	61.6	67.9	79.5	4.6	3.4	3.1	2.6	3.4
	5	51.7	72.7	88.7	74.4	3.7	2.9	2.0	2.8	2.9
	6	46.9	71.7	81.1	64.1	3.9	2.9	2.5	3.3	3.2
	7	23.8	74.7	81.1	71.8	4.9	2.8	2.5	2.9	3.3
	8	20.4	21.2	28.3	35.9	5.0	5.0	4.7	4.3	4.8
	9	12.9	27.3	67.9	64.1	5.5	4.7	3.1	3.3	4.2
	10	2.0	13.1	66.0	56.4	6.8	5.5	3.2	3.6	4.8
	11	.0	25.3	45.3	38.5	7.6	4.8	4.0	4.2	5.2
	12	5.4	36.4	71.7	74.4	6.2	4.3	2.9	2.8	4.1
	13	6.1	20.2	66.0	74.4	6.1	5.0	3.2	2.8	4.3
	14	.0	2.0	13.2	17.9	7.6	6.8	5.5	5.2	6.2
	15	4.1	10.1	50.9	56.4	6.4	5.7	3.8	3.6	4.9
						79.6	62.0	56.0	48.7	64.5
IV	1	94.4	96.4	95.4	100.0	1.4	1.1	1.3	.0	1.0
	2	52.1	80.7	77.3	96.0	3.7	2.5	2.7	1.2	2.5
	3	31.3	37.4	63.6	92.0	4.5	4.3	3.3	1.7	3.5
	4	37.5	33.7	54.5	74.0	4.3	4.4	3.6	2.8	3.8
	5	16.7	29.0	63.6	74.0	5.2	4.6	3.3	2.8	4.0
	6	13.9	26.5	59.1	76.0	5.4	4.7	3.5	2.8	4.1
	7	24.3	47.0	90.9	92.0	4.8	3.9	1.8	1.7	3.1
	8	12.5	32.5	72.7	98.0	5.5	4.5	2.9	.8	3.4
	9	4.2	59.0	68.2	90.0	6.4	3.5	3.1	1.9	3.7
	10	13.2	43.4	59.1	86.0	5.5	4.0	3.5	2.2	3.8
	11	18.1	53.0	81.8	82.0	5.2	3.7	2.5	2.4	3.5
	12	11.1	32.5	59.1	94.0	5.6	4.5	3.5	1.5	3.8
	13	6.3	14.5	27.3	64.0	6.1	5.4	4.7	3.3	4.9
	14	29.8	65.0	77.3	86.0	4.6	3.2	2.7	2.2	3.2
	15	1.4	6.0	9.1	48.0	7.1	6.1	5.8	3.9	5.7
						75.3	60.4	48.2	31.2	54.0



all the sentences in this study and the earlier one to the same point, and thus make possible the arrangement of all the sentences together into alternative tests, the general scale values of the earlier study were redetermined by exactly the same method as was used with the words and referred to the same zero-point. The 104 sentences referred to this point were arranged in order of difficulty and thereupon grouped into 10 tests of approximately the same difficulty. The first test contains 12 sentences grading up by steps of .5 P. E. except the step between the eleventh and twelfth sentences. The remaining tests contain ten sentences each and are graduated by steps of .5, .4 or .2 P. E. with exceptions here and there to make the sum of the scale values or weights approximately equal. Tests 8 and 9 contain the 20 sentences remaining after the best arrangements for the other tests had been made.

The tests have been arranged in small groups in order that they may be given easily in any class period and the factor of speed has been avoided so far as possible. In giving the tests no time limit is therefore set. The sentences are scored as either right or wrong. No attempt has been made to give fractional weights where a part of a sentence is correctly translated.

The ten tests, with the scale values for each sentence and their sum, and standard June scores in terms of the average number of sentences correct and the sums of the scale values for each of the four years of high school Latin, are as follows:

*Sentence Test 1.*

1. .5—Puer bonus est.
2. 1.0—Puer in agro est.
3. 1.5—Exercitus est magnus.
4. 2.0—Ubi sunt copiae hostium?
5. 2.5—Via erat longa et lata.
6. 3.0—Eum ire iussit.
7. 3.5—Equites tam celeres sunt ut nostri eos sequi non possint.
8. 4.0—Nemo est qui pugnare quam pacem habere malit.
9. 4.5—Cum in urbem venissem et ibi de principis fortuna bona certior factus essem, domum ivi.
10. 5.0—Dicere non possum quam diu pater meus in eo loco fuerit.
11. 5.5—Qui bonum cum potest non defendat non laudandus est.
12. 5.8—Cum omnia incensa sint domi nihil est quo vitam tenere possint.

	1	2	3	4
Average no. of sentences correct	5.3	6.4	8.1	9.5
Sum of scale values .....	9.8	14.0	21.8	28.3

*Sentence Test 2*

1. 1.7—Navis parva est.
2. 2.2—Sunt viri fortes.
3. 2.7—Milites magna cum virtute oppugnabant.
4. 3.2—Urbs, quae eo tempore non munita est, facile capta est.
5. 3.7—His rebus cognitis, totus exercitus prima luce disceserunt.
6. 4.2—Nuntius matri dixit filium noctu venturum esse.
7. 4.7—In eo loco ad multam noctam se defenderunt.
8. 5.2—Equites contenderunt ut quam primum domum pervenirent.
9. 5.7—Cui nos qui superati sumus arma nostra tradimus?
10. 6.2—Locus castris muniendis facilis nobis deligendus est.

---

39.5

	1	2	3	4
Average No. of sentences correct	3.9	5.6	6.0	7.0
Sum of scale values .....	10.5	18.1	22.5	24.2

*Sentence Test 3.*

1. 1.6—Homo malus est.
2. 2.7—Tuum fratrem non video.
3. 3.1—Alii proelium relinquunt, alii magna cum virtute pugnant.
4. 3.5—Eos tribus diebus in hoc loco videbimus.
5. 3.9—Dic mihi quid tibi in animo sit.
6. 4.3—Ille dux nomine sed non factis amicus erat.
7. 4.7—Pacis faciendae causa homines ex his urbibus a senatu appellati erant.
8. 5.1—Hoc faciemus ut domum sine iniuria veniat.
9. 5.5—Si imperator esses, daresne proeli committendi signum?
10. 5.6—Res tuae ita secundae erant ut ab dis auxilium non peteres.

---

40.0

	1	2	3	4
Average no. of sentences correct	3.0	3.8	6.1	7.0
Sum of scale values .....	7.5	16.3	21.6	25.5

*Sentence Test 4.*

1. 2.4—In hoc loco castra ponere non possumus.
2. 2.8—Dux filio telum dedit.
3. 3.2—Amicus meus servos bonos habet.
4. 3.4—Scimus ubi hae res sint.
5. 3.6—Equites urbem hostium magna cum virtute oppugnaverant.
6. 4.0—Copiae auxilio amicis missae sunt.
7. 4.4—Periculis multis in vita superatis mortem non timebit.
8. 4.8—Scit te saepe nomen imperatoris huius audivisse.
9. 5.1—Eo cum venisset principes ad se duci iussit.
10. 5.6—Alii alia dixerunt sed omnes eum magna virtute esse sciebant.

---

39.3

	1	2	3	4
Average no. of sentences correct	2.5	3.9	6.1	6.5
Sum of scale values . . . . .	7.9	13.5	22.9	28.2

*Sentence Test 5.*

1. 2.5—Milites ex castris ducit.
2. 2.9—Bellum decem annos gesserant.
3. 3.3—Hi omnes magnae virtutis erant.
4. 3.5—Nihil novi de bello audiivi quod non in urbe fui.
5. 3.7—Eques magno cum periculo ducis vitam defendit.
6. 4.1—Rogamus ut pax cum finitimis nostris sit.
7. 4.5—Navem post primam lucem non relinquebant.
8. 4.9—Nonne vereris ne omnem fortunam amittas.
9. 5.3—Centum naves corpora armaque quae post proelium in agris relictæ erant contulerunt.
10. 5.6—Patrem fortiorem filio esse dicent.

---

40.3

	1	2	3	4
Average no. of sentences correct	1.8	3.5	5.9	5.9
Sum of scale values . . . . .	6.0	12.1	22.2	23.8



*Sentence Test 6.*

1. 3.0—Pater vocat filium.
2. 3.2—Filia parva in periculo est.
3. 3.4—Undique pugnatum est.
4. 3.6—Mors homines superat.
5. 3.8—Hoc bellum nobis maxima cum virtute gerendum est si vincere volumus.
6. 4.0—Ad quem eius pater nuntium misit?
7. 4.2—Dux dicitur pervenisse.
8. 4.4—Este fortes, milites, et tela longissime conicite.
9. 4.6—Quorum adventu spes matri meae erit.
10. 4.8—Nunc rogas quid facere possim?

---

39.0

	1	2	3	4
Average no. of sentences correct	3.0	4.1	6.2	7.0
Sum of scale values .....	10.0	14.7	23.6	26.8

*Sentence Test 7.*

1. 3.1—Servum misit quem secum habebat.
2. 3.3—Prima luce proelium ab hostibus commissum est.
3. 3.6—Id dictu quam factu facilius est.
4. 3.7—Illi homines duos amicos habebant.
5. 3.9—Dies tres exercitui praerat.
6. 4.1—Poteritne in eam urbis impetum facere?
7. 4.3—Vereor ne frater eius malus sit.
8. 4.6—Rogas cur proelium nunc relinquere velim.
9. 4.7—Hoc consilium belli gerendi causa cum finitimis suis fecit.
10. 4.9—Si armis uti potuisset, non profectus asset.

---

40.2

	1	2	3	4
Average no. of sentences correct	2.3	4.0	6.1	7.1
Sum of scale values .....	8.5	15.0	23.8	27.9

Sentence Test 8.

1. 3.0—Hi pueri exercitum hostium viderunt.
2. 3.2—Filius patris similis erit.
3. 3.4—Incendite domos vestras et iter nobiscum facite.
4. 3.8—Mors finis esse videtur.
5. 3.9—Cum miles fortiter in bello pugnauisset ad domum  
profectus est.
6. 4.1—Si telum coniciat periculum sit.
7. 4.3—Huic viro multi servi erunt.
8. 4.6—Auxilium mittet ne hostes urbem capiant.
9. 4.8—Tertio anno belli vincemus.
10. 5.0—In imperatore deligendo magna virtus petenda est.

---

40.1

	1	2	3	4
Average no. of sentences correct	2.8	3.7	5.9	6.8
Sum of scale values . . . . .	10.1	14.1	22.7	26.5

Sentence Test 9.

1. 3.3—Muri urbis alti erant.
2. 3.8—Urbs ab exercitu diu occupata est.
3. 3.9—Dixit se dare quod peterent.
4. 4.0—Consul cum decem milibus equitum in fines hostium  
profectus est.
5. 4.2—Miles tibi telum dabit.
6. 4.6—Viam facimus quo facilius eos sequamur.
7. 4.6—Cur te in his periculis non defendisti?
8. 4.9—Castra consulum a nostris paucis diebus capientur.
9. 4.9—Nuntius profecturus, amicis de itinere nihil dixit.
10. 5.1—Velim fratrem tuum roges, ne nos relinquat.

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43.3

	1	2	3	4
Average no. of sentences correct	1.7	3.0	5.0	6.2
Sum of scale values . . . . .	6.5	12.3	21.3	26.4

*Sentence Test 10.*

1. 3.3—Amicus pueri nuntius erat.
2. 3.8—Hoc proelio facto copias in fines suos ducit.
3. 3.8—Multi undique venerunt ut pacem ab illo duce peterent.
4. 3.9—Haec urbs multo maior eo oppido erat.
5. 4.0—Dixit se urbem oppugnaturum esse.
6. 4.2—Dixit se nuntium pacis fuisse.
7. 4.6—Milites urbi auxilio erunt.
8. 4.9—Si hostes vincant, fines nostros relinquamus et alias domas petamus.
9. 5.0—Nihil habeo quod populo dem.
10. 5.4—Eius frater veritus est ne opus difficilius esset.

42.9

	I	2	3	4
Average no. of sentences correct	2.2	3.4	5.3	5.8
Sum of scale values . . . . .	8.4	12.4	22.3	23.9

An examination of the scores will show that while the sums of the scale values do not differ greatly the tests vary somewhat in difficulty with the different years. For instance, Test 2 is relatively easy for the first and second years, but relatively difficult for the third and fourth years. Test 5 in the fourth year, Test 6 in the first year, and Test 8 in the first year show irregularities. The sentences have been tried out in a great variety of permutations and combinations to reduce these irregularities to a minimum.

This completes the study of Latin vocabularies and sentences which the writer expects to make. There are available 250 words scaled for testing purposes and 102 sentences. Further work is planned looking toward the development of tests of knowledge of construction and syntax using these standardized sentences as a basis therefor. Studies of vocabularies and sentences in French and German will be published in the near future.



# The Rational Learning Test Applied to Eighty-one College Students

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In a recent preliminary report<sup>1</sup> the writer described in detail the method of a new rational learning experiment which promises to have considerable value as an intelligence test. It is the purpose of the present article to study more fully the test-value of this type of learning. Few intelligence tests have attempted to measure quantitatively the effectiveness of a continued reasoning process; because of the difficulty of method in such a complex process, the tests have almost entirely been confined at best to more or less disconnected judgments about different sorts of relationship. In many cases tests designed more or less definitely to measure mental ability of some sort, have stressed rapidity and accuracy in certain acts of skill or of comprehension and retention. The present test—if we may so designate it—measures accurately and easily, and with no more apparatus than a stop watch, a screen, some sheets of paper, all one's relevant responses in a reasoning and memory process to a definite, objective situation. By increasing or decreasing the number of associations required—the number of letters used—the test can be varied in difficulty from the simplest type of problem to one that cannot be mastered by anyone.<sup>2</sup>

Each subject (S) is tested individually in a quiet room. It is important that the experimenter or tester (E) is concealed behind a screen where what he writes and his facial expression cannot be seen by S. S is allowed to read carefully, twice, the following instructions:

The letters A, B, C, D, E, F, G, H, I, and J are numbered in a random order from 1 to 10. I call out the letters in their order and you are to guess numbers for each letter till you get the correct one, when I say "Right!" Then I call out the next letter, and so on. This continues till you get each number right, the first guess, twice through the series in succession from A to J. Then you are through. *You must ask no questions*

<sup>1</sup>PETERSON, JOS. *Experiments in Rational Learning. Psychol. Rev.*, 1918, 25, 443-467.

<sup>2</sup>If more than twenty-six letters are desired different two-letter combinations may be used, as AA, AB, AC.....BA, BB. BC.....CA, CB, CC, CD, etc.

after the experiment starts, but are to use all the mental powers at your command. You will be judged by (1) the total time you take, (2) the number of errors made, or wrong guesses, every number you call out being a guess, and (3) the number of repetitions from A to J required. Ready!

E then calls out A, recording all S's guesses in order under this letter on the record sheet. When the correct letter for A is given, which at this stage depends wholly upon chance, B is called out; and so on to J, which can be guessed with certainty if S has kept his cues in mind and has been wide awake. This is the first series; other series are repeated until the stage of perfection is reached that is described in the instructions. The chance element gradually yields to rational control as the successive letters are called out. In subsequent series the errors decrease in proportion to S's mastery of the situation. While the reader is referred to the original article, already cited, for a full explanation of the details of the method, the following record of one subject's reactions is repeated here for convenience of reference (Table I):

The responses (errors) marked (†) are called *logical errors*, because they repeat numbers which have already been used for earlier letters of the series and could not, according to the conditions of the experiment, be correct. The responses marked with an asterisk (\*) are *perseverative errors*, repeating numbers already guessed (wrongly) for the letter in question, before its correct number is found. These are the most serious errors. A reaction may thus receive three error-counts—one as an "unclassified error," one as a "logical error," and one as a perseverative error."

The scores of eighty-one college students have been correlated with scores made by these same students in the second half year of General Psychology. The students were in three different sections, all conducted by the writer in the University of Minnesota in the second half of the academic year, 1917-1918. Most of the students were sophomores. There were in these sections other students than those whose records are here reported, some of whom had been tested by a slightly different method, so that their results cannot be used here, and some of whom could not arrange an appropriate time for the tests. There was, however, no selection that would make for an unfair sampling.

TABLE I  
RECORD OF MR. L. D., A SOPHOMORE STUDENT

Letters Numbers	A 9	B 6	C 2	D 10	E 8	F 1	G 5	H 4	I 7	J 3	ERRORS			
											Un- classi- fied	†	*	Total
First Series, ....	3 5 1 2 9	8 7 10 3 1 6	5 3 1 7 10 9† 4 2	5 7 10	8 7	7 5 4 1	10† 3 5	10† 3 1† 7 6† 9† 2† 7* 9†* 2†* 4	5† 3 7	3				
											35	10	8	48
Second Series, ..	2 6 8 4 1 9	6 9† 2	10 9† 2	9† 7 10	7 9† 8	7 5 3 9† 1	7 3 5	5† 3 9† 7 5†* 7* 9†* 10† 6† 9†* 6†* 4	7 1	9† 10† 6† 8† 2† 1† 3				
											33	18	5	56
Third Series, ...	8 6 9	2 4 8 10 1 7 8* 6	10 1 8 6† 3 7 5 8* 6†* 5* 4 10* 2	10	7 5 3 1 8	1	7 3 4 2† 5	4	3 7	3				
											30	8	5	38
Fourth Series, ..	9	6	2	10	8	1	5	4	7	3	0	0	0	0
Fifth Series, ....	9	6	1 8 2	10	8	1	5	4	7	3		2	0	2
Sixth and seventh series correct														
U. O. Errors ...	11	12	23	4	6	7	8	20	3	6	100			
† Errors ...	0	0	4	1	1	1	2	15	1	6		31		
* Errors ...	0	1	4	0	0	0	0	8	0	0			13	
Totals, .....	11	13	31	5	7	8	10	43	4	12				144



Ten of the eighty-one persons whose records are here reported were kindly tested for the writer in the final rush near the end of the academic year by Miss Alice H. Sullivan, at the time a scholar in the Department of Psychology in the University of Minnesota, whose aid is here gratefully acknowledged. As Miss Sullivan had previously tested but a few individuals by this method, it is probable that this irregularity slightly reduces the reliability of the tests. Of the special cases discussed in subsequent pages, the one marked "b" in Table II was tested by Miss Sullivan.

The scores in psychology are the average scores made in six short, technical examinations. Grades made in other subjects were not used because the writer had no evidence that the grading of papers had been done accurately enough for our present purpose. It is well known that most instructors make the grading of papers a most unscientific procedure.

A brief statement of the method used in securing and grading the psychology examination papers is here *a propos*. The method was not devised simply for this test, but has been used by the writer, with but slight modifications, for seven or eight years. Each examination has a definite time limit, which is so short that no student, with rare exceptions, gets through before time is called. The time in different examinations is not constant, as there is no reason for believing that all of the examinations are of exactly equal difficulty. There are enough questions given each time so that students will be kept busy without great elaboration on any one point and the students are instructed to be definite and brief. The writer believes that an examination which the best students can complete in less than the allotted time is not fair to such students; that it does not make the differences among the members of a class that actually exist. It is impossible in advance, moreover, to say, just what maximum values should be given each question, no two being equally difficult. To make up for this lack of accuracy in evaluating the several questions, it has been found best to make each question call for definite facts, for a specified number of reasons for or against a certain theory, or for points favoring or contradicting given interpretations of the results of an experiment; and also to assign, and to indicate with the questions, a maximum point-value to each question. Students can then see in advance just how to distribute their effort for the greatest number of points possible

to each according to his preparation. A maximum of thirty points is possible in any one examination. It is necessary to have this total constant, so that whenever any student happens to be absent from an examination his average can simply be found without any weighting.<sup>3</sup> The examinations are not announced in advance, so students are not aware, except as they are able to guess, when a written test will be given.

To keep effort high throughout the course, papers are, with rare exceptions, returned at the next meeting of the class, each paper bearing the scores given each answer, the total score, and the rank in the class or section. The rank is, of course, based on the total score. By this means each student knows his own weaknesses and also just how he ranks in the class. While the returned papers are in the hands of the students, the instructor reads the questions in order and answers each in a few definite statements. This not only gives additional assurance against error in assigning and adding up scores, but it also helps each student get any wrong idea corrected as soon as possible—an important element in any learning process. The papers of the examinations in question were all graded by a graduate student, a scholar in the department, who was not acquainted with the students, a man who had had considerable experience reading papers for the instructor (the writer). The reading of the papers was, however, carefully supervised by the instructor, who wrote out with each set of questions the sort of answers that would be acceptable. Part credit was allowed whenever the answer had a degree of value but not full value.

This method has been found by the writer to stimulate a high degree of effort on the part of students. It arouses wholesome competition, each student knowing that he can advance in rank only by surpassing some one else in the class; and that at the end of the course, only approximately 5% of the students—those with the

<sup>3</sup>Here there is a source of error that the writer has not fully overcome in a practicable manner. The average number of points made by the class in the several examinations is not a constant: that is, some examinations are found to be slightly easier than others. The time allowed usually varies from twenty to thirty minutes, being longer for harder questions. The three sections of students in this study did not take the same examinations, either: two sections meeting in successive hours had the same examinations and one section had a different examination. Here, then, are two factors slightly working against an exact ranking of the students in the psychology examinations. They will lower our correlation somewhat, as will also, probably, the fact mentioned in the second preceding paragraph.

best scores—will receive grade “A”; the next 20%, “B”; the middle half, “C”; the 20% below these, “D”; and that the lowest 5%, approximately, will be conditioned or get a failure in the course.

This is the method by which the scores in psychology used in the correlations below were obtained, a method, it is admitted, that lacks perfection in many respects. The work in the courses was not as mechanical as this statement might imply. The instructor soon because personally acquainted with all the students, and tried to get as close individual contact with each of them as possible. The final grades for the work of the course were determined in part by the students’ reports on experiments and on other written work. The correlations here determined, however, are based *only on the average number of points made in the six short, technical examinations*; because these data are regarded as most reliable and most indicative of the student’s ability. These psychology scores are correlated

Psych.	8-	9-	10-	11-	12-	13-	14-	15-	16-	17-	18-	19-	20-	21-	22-	23-	Freq.
R.L.	8.9	9.9	10.9	11.9	12.9	13.9	14.9	15.9	16.9	17.9	18.9	19.9	20.9	21.9	22.9	23.9	
20-	99	(//a)						(X)		X							8
100-	179				///	///			X	X							19
180-	359			///	///	///	///	X									19
260-	539	///				///	///										10
340-	719							X									8
420-	899	(O)						X									4
500-	1079							X									4
580-	1259								X								2
660-	1439																1
740-	1619																2
820-	1799																1
900-	1979	X															1
980-	2159																0
1060-	2339																0
1140-	2519	O	X														2
1219																	
Freq.	1	7	4	5	11	10	8	4	3	7	5	5	2	3	4	2	81

TABLE II

Showing the Distribution of 81 College Students on The Basis of The Average Score in Six Examinations in General Psychology and of Fewness in the Rational Learning Test. Circles Indicate Approximate Means of Columns and Crosses those of Rows. The Circle and the Cross in Broken Lines Show the Means of Their Respective Column and Row When the Two Cases Marked “a” Are Omitted.

(inversely) with the total number of errors made in the rational learning test that is, with the unclassified errors *plus* the logical errors *plus* the perseverative errors, as described and illustrated



above. This score was found to be more significant than the time taken to complete the test or then the number of series required to fix the numbers, or than either of these three kinds of errors by themselves.

## RESULTS

The correspondence between the point-scores made in psychology and the fewness of errors in the rational learning test is shown in general in Table II. Each individual mark in the rectangles formed by the crossing of columns and rows indicates the position of one person as determined by both tests. Thus the two marks near the upper left hand corner of the table, marked "a", show that two students getting only an average of from 9 to 9.9 points in the psychology examination made but from 20 to 99 errors in the rational learning test. The mark in the upper right hand corner of the table indicates a student ranking among the best in both tests, while the one in the lower left corner is for a student that was the poorest in psychology, making an average score of only 8 to 8.9 points, and one of the two poorest in the rational learning. The records of the individual scores show that she was actually the poorest also in the rational learning, making a total of 1160 errors.

The heavy circles and crosses in the table mark the approximate means of the columns and rows, respectively. If a smoothed line be drawn through the crosses it will show the changes that take place in the x-values (right and left) as we go up the table from many to few errors in the rational learning. On the other hand, a similar smoothed line through the circles will show the regression line of the columns, or the changes that occur in the y-values with changes (to the right in the table) to better and better scores in psychology, or in x-values.

The table at once makes two important points clear. In the first place the two sets of relationships described in the foregoing paragraph are not in mutual agreement; that is, the regression of the x-values on y is not equal to the regression of the y-values on x. There is a pretty general and constant tendency to increase, though not to increase equally, in the x-values (points in psychology) with increases in the y-values (*i. e.*, with decreases in the number of errors in rational learning); but there is *not* such a constant tendency for the y-values to increase with increase in the x-values.

In more easily comprehensible terms, decrease in errors in rational learning seems in general to mean increase (though in a lesser degree) in scores in psychology, while increase in scores in psychology is not so constantly or so regularly accomplished by decrease in errors in the rational learning. The rational learning scores are probably more indicative of the student's ability than are the psychology scores, for the rational learning test was given once only and lasted but a short time, during which the subject as a rule applied his best effort; but a good record in psychology was dependent, within certain limits, not only on ability, but also to a considerable extent on such contingencies as health, the state at each test of having or not having reviewed well, having been free from disturbances in one's study, etc. It is evident that a student with but fair ability in the rational learning, by extra energy and application and precaution to review before each recitation, *can* make a good score in the examinations, while one with very good ability *may* on account of illness, eye trouble, or interference with study by the visit of relatives or friends or by social distractions, make a poor score in psychology. The rational learning test, therefore, seems to show more accurately what one can do in psychology, than what one influenced by all these factors actually will do.<sup>4</sup>

While correlations and regression lines show only general tendencies, and one must be careful not to yield too much to the temptation of "interpreting" exceptional cases, it may be said here, as an illustration of the various conditions affecting the psychology score, that the two individuals marked "a" in the distribution table are persons who made poor records in examinations because of lack of study. The one is a girl who admitted when she took the rational learning test and surprised the instructor by her efficiency that she had not studied her psychology. She said that she was economically independent and didn't "need to prepare for anything." Knowing of this attitude during the last month of the course, the instructor thereafter found it possible to interest her in certain phases of abnormal psychology; but this was too late to raise materially her average score in the examinations. The other person in this rectangle is a girl of exceptionally good ability, as it appears both from the test

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<sup>4</sup>Ruml distinguishes between accidental and constant errors in school grades, and, somewhat in conformity with our findings even when grades were given with the greatest of care, says: "...the use of grades as a criterion of academic ability is open to serious objections." *Psychol. Monog.*, No. 105, p. 6.

and from later conversations, who was being treated for serious eye-trouble. She was not permitted by her physician to use her eyes in study. Both of these students had fallen seriously behind with their laboratory work, on which the examinations were partly based; and the one with the eye-trouble was necessarily rather irregular.

The case marked "b" in the table was a mature woman, who was taking only the one course in the University and was putting an excessive amount of time on it. She took the competition seriously. It was, however, a surprise to the instructor that she fell so low in the rational learning test. He regarded her as considerably above average in intelligence. Her attitude was, however, too subjective. The student at the lower left corner of the table, while she was studious and serious-minded, was considered the dumbest in the class, though more mature in years than most of the members. The five students in the four upper right hand squares had, from all evidences available, very superior ability, and their attainment in the rational learning was no surprise to the instructor.

The second important fact revealed in Table II is one already indicated in other words, namely, that the regression line of  $y$ -values is non-linear. We note, as we go toward the right of the table— increase in the  $x$ -values,—first a very sudden increase in the  $y$ -values, one that would be more evident if the two cases marked "a", already discussed, were rightly placed in the psychological examinations, so that the mean of the second column would be lowered considerably; and then, until the last column is reached, no regular tendency to change with the increase of  $x$ -values. It seems that after a certain ability in the rational learning has been reached, further increases in this kind of ability or abilities is not necessary for the making of a fair or even a high standing in psychology, such standing depending on various other factors such as already noted. Exceptionally high scores in psychology, however, may be possible in general only to exceptional ability to cope with the rational learning test.

We must not forget here that college students generally are survivals of an elimination process in the grades and in the high school. The differences in their abilities are therefore not as great, relatively speaking, as is generally true of adults, though their interests may be as various. If we had a thousand unselected adults



prepared as well for psychology as their abilities would permit with the years of training that a sophomore has received, it is probable that the correlation in our table would be much higher, that the individual tallies would be found more nearly in a straight line reaching from the lower left to the upper right hand corner; for more cases of comparatively poor standing in the rational learning would pull down considerably the scores at the left two-thirds of the table. In other words, we are here dealing with a highly selected group of individuals and hence get non-linear regression of the values most indicative of ability, and only fair correlation by the usual methods of calculation. The product-moment formula of Pearson gives a correlation of only  $.33 \pm .07$  of psychology scores with fewness of errors in the rational learning test. Omitting the two cases at the upper left hand corner of the table, already discussed, we get  $r = .45 \pm .06$ . Worked out by the tabular method illustrated by Rugg,<sup>5</sup> we get with the 81 cases  $r = .23 \pm .07$ . By this method, of course, there are a number of slight displacements from the true position of persons nearly equal in ability, displacements that result from calling equal all those that fall within one column or row. Such displacement from the true position tends to lower the correlation; this is the explanation of the lower correlation by the tabular method.

#### CORRELATION RATIO

It is evident from the non-linearity of the means of the columns that we cannot in this study apply the formulæ for correlation that are usually used, formulæ that apply only to linear regressions. If we apply to the scores as distributed in our table, the formula for

the correlation ratio, 
$$\eta = \frac{\sqrt{\frac{S[n \sum_x (y - \bar{y})^2]}{N}}}{\sigma_y}$$
 we get a correlation

of  $.63 \pm .04$ , which is rather high for a selected group of the kind here considered.<sup>6</sup>

<sup>5</sup>Statistical Methods Applied to Education, p. 264.

<sup>6</sup>According to Blakeman a correlation table may be regarded as exhibiting non-linear regression if  $\frac{\sqrt{N}}{.67449} \cdot \frac{1}{2} \sqrt{\eta^2 - r^2} = 2.5$ , or more. We are

therefore safe in assuming non-linear regression in this case, for the value of this expression is 3.93. For the significance of each of the letters in this equation and in that for the correlation ratio, see RUGG, *op. cit.*, 278 ff.

If the rational learning test had been made harder for this group of students, by the use of a larger number of letters and therefore of the associations to be established, it is probable that a better distribution of abilities would have been made by this test. However, we must be careful regarding such an assumption, for a marked increase in the number of letters has seemed in other tests by the writer to throw too much emphasis relatively on mere rote memory and therefore not to give sufficient room for the better forms of rationalization pointed out in our earlier article. It is probably this organized ability, particularly, that is most indicative of intelligence.

Our correlation is hardly comparable with correlations obtained by other investigators between school standing and intelligence tests, because our scholastic standing was obtained in but one subject and by a method somewhat different from that commonly used. Terman found a correlation of .45 between the intelligence quotients of 504 children and their school work as judged by their teachers.<sup>7</sup> King and McCrory correlated the ratings by various tests on freshmen entering the College of Liberal Arts, University of Iowa, with their freshmen grades. There were 276 women and 268 men tested. These correlations were obtained:

	<i>Women</i>	<i>Men</i>
University grades with Opposites test. ....	.45	.84
Completion test. ....	.22	.41
Logical Memory test, ....	.35	.40
Analogies test, ....	.14	.40
Range of Information test, ....	.41	.44

In a different opposites test on 56 engineer freshmen, King got a correlation coefficient of but .26 with scholastic standing, while at Beloit College K. T. Waugh got a correlation with class standing of .84.<sup>8</sup> F. O. Smith, tracing the records of 120 students of the College of Liberal Arts of the University of Iowa, got a correlation of only .48 between high school average and university freshman average, making it obvious that very high correlations with scholastic standing cannot be expected.<sup>9</sup> In a recent study by Marie Hackl

<sup>7</sup>*The Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence*, 1917, 105 ff.

<sup>8</sup>See KING, I. AND MCCRORY, J., *Freshmen Tests at the State University of Iowa*. Jour. Ed. Psychol., 1918, 9, 32-46.

<sup>9</sup>*A Rational Basis for Determining Fitness for College Entrance*, University of Iowa Studies in Education. N. S. 51, 1912.

Means a correlation of  $.54 \pm .08$  was obtained between the ratings by an opposites test of one hundred words given orally and individually to 73 students and the ratings in psychology on the basis of fourteen tests. The psychology class was conducted by Dr. E. K. Strong, Jr., in George Peabody College for Teachers. In this case the scholastic rating is made by a method much like our own.<sup>10</sup>

Experiments are now in progress by which we hope to compare ratings by the rational learning test with ratings by the Terman revision of Binet-Simon tests. The median time for giving the former test to college students under the conditions of the study here reported was only sixteen minutes, and the test can be given with almost absolute objectivity by any one who understands the technique and who has had but a small amount of practice. Its value lies not simply in being—as it seems—a fair intelligence test, but it also gives promise, as was shown in the earlier report, of being a means of classifying the subjects tested into two or three rather well-marked groups with reference to their attitudes—the subjective or self-conscious, the objective rational, and the objective trial and error. The first two of these groups correspond to Ruger's self-conscious attitude and problem attitude, respectively.

#### SUGGESTIONS FOR GIVING THE RATIONAL LEARNING TEST

In giving the rational learning test the experimenter should select a room free from distraction, and should have a stop watch (though this is not an essential), a screen to put up between himself and the subject, a copy of the instruction sheet, and some sheets of paper. While the subject, S, is reading the instructions, the experimenter, E, prepares the test-sheet heading as follows:

A	B	C	D	E	F	G	H	I	J	
9	6	2	10	8	1	5	4	7	3	Total E, Log. E, Per. E

He also records in the upper right hand corner of the sheet S's name, grade, and any other information or remarks desired, as well as the date and, if he has not a stop watch, the exact time of starting the experiment. Besides recording in order S's responses, or guesses, for each letter as explained and illustrated in the foregoing pages and more fully in the previous article already cited, E should also devise symbols of his own for recording various secondary responses, such as apparent doubt or certainty in S's mind as to his guess,

<sup>10</sup>A Tentative Standardization of A Hard Opposites Test, to be published.



length of hesitation, retraction of number guessed (though it is retained in the record as already explained), and the various squirmings, complaints, excuses and questions of some subjects. The length of hesitation at any one point can easily be indicated by putting a dot for approximately each second. To all questions and excuses E must, of course, remain silent, but he can easily indicate them for the interpretation of results. The errors are to be classified and counted up at E's leisure.

E's relation to S in the course of the test is such as to afford an unusual insight into the latter's mental make-up. The writer was once greatly interested in this aspect of the testing when he had a rather garrulous subject of about fifty years of age, who continuously raved and charged himself with all sorts of mental deficiency, of which he now had objective proof, even to being, as he had often supposed, "an imbecile." This was an extreme case of a person who had fallen into the bad habit of avoiding real difficulties by circumlocution. The writer, as his instructor, had frequently called S's attention to this semi-pathological tendency and had made suggestions for its correction, but to little effect because of the seniority of S. Now the test afforded an excellent illustration of the futility of such behavior, in fact of its hindrance to the efficient mastery of the problem at hand, and of the need of getting right at the essentials of the situation. S had to stick to the problem to its finish as indicated in the instructions, and the lesson had a good effect.

#### RATIONAL LEARNING NORMS FOR COLLEGE STUDENTS

Table III gives in a condensed form the tentative norms of rational learning, derived from the eighty-one college students whose records we have considered in the foregoing pages. The results are arranged in percentile tables. No attempt has been made to separate the sexes, as there were only seventeen men in the group, due to war conditions. Percentiles are given for each class of errors separately as well as for all together; also for the number of minutes required to master the problem, and the number of repetitions through the series, including the last two without errors. The hundredth percentile is simply the best record. The tenth to the ninetieth percentiles were accurately determined by considering the distribution to be a continuous series and taking the exact point in

question, not simply by taking the nearest actual score obtained. It is obvious that the percentiles nearest the median will in the long run prove to be the most reliable or stable.

TABLE III  
PERCENTILES OF THE SCORES IN THE RATIONAL LEARNING TEST,  
BASED ON THE RECORDS OF EIGHTY-ONE COLLEGE STUDENTS

Percentile	Total Errors	Unclassified Errors	Logical Errors	Perservative Errors	Time (Min.)	Repetitions
100	35	33	1	0	6	6
90	102	71	19	0	10	8
80	119	94	25	1	11	9
70	159	111	35	3	14	11
60	193	139	49	7	15	12
50	227	163	56	9	16	13
40	287	202	68	11	19	14
30	340	226	93	17	22	17
20	426	295	116	22	26	18
10	598	371	155	30	31	21
0	1160	788	338	82	60	32

From this table one can readily compare the record of any person with that of the students of this group. For example, a person making a score of 190 T. E., 163 Uc. E., 20 L. E., 11 P. E., 19 min., and 11 repetitions would be seen to surpass about 60% of our group in total errors, 50% (be exactly at the median) in unclassified errors, 90% in logical errors, 40% only in perseverative errors and in time, and 70% in the number of repetitions required. This would indicate ability slightly better than the median, but a tendency toward subjectivism as shown by the comparatively large number of perseverative errors and minutes. Just what this record indicate for the subject's mental ability may be gathered, so far as is known from foregoing discussion of correlations and regressions, and from the discussion of the earlier article cited.

# The Effects of Practice Upon Two Mental Tests

J. F. DASHIELL

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The success of psychological tests, as they are beginning to be used in practical ways to determine the intellectual capacities of a man, depends to some extent upon whether those tests can be trained for or not. If they can be trained or coached for, their usefulness in many or most channels will, obviously, be very seriously impaired. Psychological examination has made tremendous strides in the last ten years in the devising of tests, but the present need is for their more critical evaluation, and to-day there is becoming more and more apparent the necessity for some answer to the problem above. Put more precisely, it is a question as to whether any of the psychological tests are subject to training, and if so, which, and to what extent? Many tests published are held to be independent of previous experience of the subjects, but exact experimental work along this line is only being begun. The general method is comparatively simple: let the proper subjects be given the test in question for a series of sittings, with or without instructions, and then measure their achievements for the series of sittings or for the last few as compared with the first few. The writer is communicating two experiments of this general type.

## THE SENTENCE-FORMATION TEST.

*Ross Hartman and J. F. Dashiell.*

This experiment was made to determine what effect training may have upon the Sentence-Formation test, Masselon Method.<sup>2</sup> Blank sheets of paper, having the three words from which sentences were to be constructed typewritten at the top of the page, were given to the subjects,—all summer session students of college grade. They were asked to write as many sentences as possible including these three words, within five minutes, the stop signal to be given by the experimenter. If nouns were given, they were to be used only as nouns, and not as verbs, and any form of the nouns could be used. In the

<sup>1</sup>These experiments were conducted in the Oberlin College laboratory.

<sup>2</sup>Described by G. M. WHIPPLE. *Manual of Mental and Physical Tests*. Baltimore, 1915, p. 627.



case of verbs, only verb forms could be used, but the verbs could be used in any tense or other verb form. The subjects were told that the sentences would be graded upon number of sentences written as well as upon their literary quality and the variety of ideas. Three sets of nouns and three sets of verbs were given to the subjects at each sitting. Only one sitting was given a day, and thirteen sittings were made in all.

The word lists had been numbered and given with a blind code system, so that the scorers, working at the end of the series, were ignorant of the order in which they had been given. When the sentences were graded, it was found that there was practically no effect of training, either in the number of sentences written at each day's work or in the quality of the sentences. To get more accurate estimates of each subject's qualitative work the sentences were graded by two people: the instructor (D) and a Senior student who conducted much of the experiment (H). D and H worked independently and each kept his scores to himself until the work was complete. D read the papers in one order, according to the blind code, H read them in the opposite order. Grades ranged from 0 to 5, and the following scale was used as an aid in grading the sentences.

- 5—sentence full and complete; quality of the best; situation fully described; not hackneyed nor prosaic.
- 4—a good sentence; situation definite; somewhat poorer than one whose grade is 5.
- 3—a simple sentence; grammatical errors; mechanical; literal.
- 2—marked error in construction; loosely organized; two independent clauses; ludicrous or absurd; situation not clear; inaccurate use of words.
- 1—omission of word; word used in the wrong sense; non-sensical quality of sentence.

In the interests of accuracy, decimal gradations between these scores were used. An amount up to 1 was deducted from the average grade of a paper for lack of variety of thought in the different sentences.

The averages for each sitting are given below, as found by each scorer:

TABLE I  
SHOWING THE DAILY AVERAGES IN QUALITY AND QUANTITY OF  
WORK DONE, AS REPORTED BY THE TWO SCORERS

Sitting	1	2	3	4	5	6	7	8	9	10	11	12	13
Number, .....	4.29	3.79	4.60	4.30	3.74	4.08	4.72	4.51	4.77	4.46	4.43	4.44	4.75
Quality (H) ...	3.51	3.28	3.57	3.52	3.53	3.31	3.57	3.74	3.46	3.36	3.51	3.33	3.68
Quality (D) ...	3.10	3.25	3.31	3.07	3.16	3.25	3.15	3.09	3.23	3.16	3.17	2.95	3.16

It may be seen that, for the group as a whole, there is qualitatively a difference of 12.2% according to one scorer and a difference of 14.3% according to the other; according to one, the best work was done on the third day, and according to the other, on the eighth day; as to the poorest work, one judges it to be on the twelfth day, the other on the second day; as to the average number of sentences written each trial, the best work was on the ninth day and the poorest on the fifth day.

Thus the differences in the numbers of sentences written and the quality of the work are not consistent and progressive differences; they are probably due largely to the differences in the words given: their difficulty, the students' familiarity with them, and so forth. Of course, there are always those elements of the subject's mood, physical and mental condition, interest, etc., which may be of large consequence in this experiment.

It may be thought at first that this lack of improvement shown for the subjects may be due to inefficient scoring methods, that they did not bring to light what differences were present and hence made the various days' results seem more alike than they really were. It remains, then, to show how nearly the graders' scores measure the actual quality of the work done. After ranking each subject according to his ability, as reported by each scorer, it was found that the correlation between the ranking given by one scorer and that given by the other scorer was 0.809, using Spearman's 'Foot-Rule' formula for correlation. Below are given the scores of the two judges reduced to relative positions. For each sitting the rankings on the left are those found by H, those on the right are those by D. These facts speak for the adequacy of the scoring methods: (a) each scorer found definite individual differences at each sitting; (b) each scorer found these individual differences to be fairly persistent thruout the thirteen sittings; (c) the correlation between

TABLE II  
SHOWING THE RANKS OF INDIVIDUALS FOR EACH TRIAL

Subject	Trial 1	2	3	4	5	6	7	8	9	10	11	12	13	Totals Trials 3 to 13	Ranks Trials 3 to 13
Ha .....	3 1	1 1	1 4	6	1 1	4 1	2 1	1 2	1 2	3 1	1 1	1 1	2	1 1 18	21
Ho .....	6 6	7 7	8 8	4½	5 7	6 5	4 5½	4 8	7 8	8 5	6 5½	6 3	6	7 6 66½	66
J .....	4 4	5 6	6 7	3	8 4	7 3½	8 5½	6 7	6 5½	6 7	7 7	5 5½	7	5 7 59	74
Lh .....	Abs.	Abs.	2 1	1	2 2½	1 2	1 2	2 1	2 1	1 2	2 3½	2 2	1	3 4 22	19
Lw .....	1 2	3 2	4 3	4½	6 5	3 8	6 4	5 3	4 5½	4 3	4 2	3 7	3½	2 3 48	44½
P .....	2 3	6 5	5 6	7	4 2½	5 6	5 7	7 5	5 3	5 4	5 8	7 4	5	6 5 57½	59
S .....	5 5	4 4	7 5	8	7 8	8 7	7 8	8 6	8 7	7 8	8 5½	8 8	8	8 8 80½	82
Z .....	Abs.	2 3	3 2	2	3 6	2 3½	3 3	3 4	3 4	2 6	3 3½	4 5½	3½	4 2 44½	30½

the rankings assigned by the two independent scorers is, as given above, high.

It is of interest on its own account that, according to the grades given by each scorer, individual differences are found to be permanent.

Finally, it is to be borne in mind that the results shown here are for adults of college age.

### THE FREE ASSOCIATION TEST—CONTINUOUS METHOD

*W. H. Lehmann and J. F. Dashiell*

The work of Wells<sup>3</sup> on free association by the discrete method, or the method of taking one response word to each given stimulus word, has shown that this form of test is definitely subject to practice effects. He found that practice: decreases association time to a limit of nearly 6/5 of a second; differentiates and particularizes responses, and increases readiness of whole vocabulary; makes responses more superficial; decreases the emotive aspect of the test.

It was the aim of the present study to see whether practice in another variety of association test would also show definite effects upon subjects' abilities therein. The one chosen was the continuous or chain method of free association. Each subject was told that a simple noun would be pronounced and that as soon as this noun was given he was to give orally as many nouns as he could think of until told to stop. The time allowed was thirty seconds. 90 words (simple nouns) were divided into 18 sets of 5 words each, two sets being given each sitting for nine daily sittings, and then the first

<sup>3</sup>F. L. WELLS. *Practice Effects in Free Association*. *American Journal of Psychology*, 22, 1-13.



and second sets being repeated for the 19th and 20th sittings on the tenth day. These two sets are given here as samples of the whole series: (1) bell, street, newspaper, fire, dress; (2) pin, snake, tree, ice, dime.

The subjects used were:

N, a boy, 9 years old;

A, a boy, 12 years old;

H, a man, 29 years old;

F, a man, 26 years old.

They were all apparently of normal intelligence.

The effect of practice upon the number of words given by each subject in the allowed time is most easily shown graphically (Figure 1). The work of the two adults, H and F, varied but little within the twenty series, one (F) improving somewhat, the other (H) actually showing loss. In the case of F, the increase in number of words given was not correlated with any measurable improvement in fertility, variety, or other qualitative characteristic; it was correlated, however, with an observable development of control over a general restlessness and "fidgetiness." H was found in other later experiments to be a rather poor subject for prolonged experimentation because of a lack of persistent interest; and in the present study this characteristic is probably partly responsible for his record. The apparent nature of his associative connections between successive words was not changed.

The work of the two boys, N and A, shows, by contrast, definite improvement. A descriptive analysis here brings an interesting fact or two to light. N on the 19th and 20th trials or sets, as compared with the 1st and 2nd, shows a far greater tendency to give merely verbal and stereotyped responses, repeating a word sometimes within one list of responses given, and frequently using over again in successive lists a whole series of easy words. This is especially true of certain color names. (Cf. Table 3.) In the case of N, then, the definite increase in number of words given in 30 seconds resulting from the practice allowed is attributable largely to his hitting upon the device of using over and over again a group of stereotyped responses (in irregular order). In this connection it should be mentioned that N paid slight attention to the exact stimulus word given him, often using it merely as a signal to start.

TABLE III  
SHOWING THE NUMBER OF OCCURRENCES OF CERTAIN COLOR NAMES WITHIN  
THE TEN RESPONSE-LISTS OF TRIALS 19 AND 20. SUBJECT N.

Stimulus	Total Number Words Given	Orange	Blue	White	Yellow	Pink	Black	Red	Green
"bell" .....	23	2	2	2	1		2		
"street" .....	15	1					1		
"newspaper" .....	17	2	2	1	1	2			
"fire" .....	14	1	1	1	1	1	1		
"dress" .....	21	1	2	2	1	2		1	
"pin" .....	16	1							1
"snake" .....	18	2	2			1			
"tree" .....	23	1	1	2	1	1		1	1
"ice" .....	20	1	1	1		1		2	
"dime" .....	10								

With the boy A, a different qualitative result was obtained. In the first two trials or sets of words the responses were all simple words taken from his more immediate environment; whereas in the last two trials the responses to the same stimulus words show much greater variety and range of thought-context.

To summarize: this preliminary experiment seems to show for boys definite effects from practice upon the free continuous association test, but for adults equivocal results.

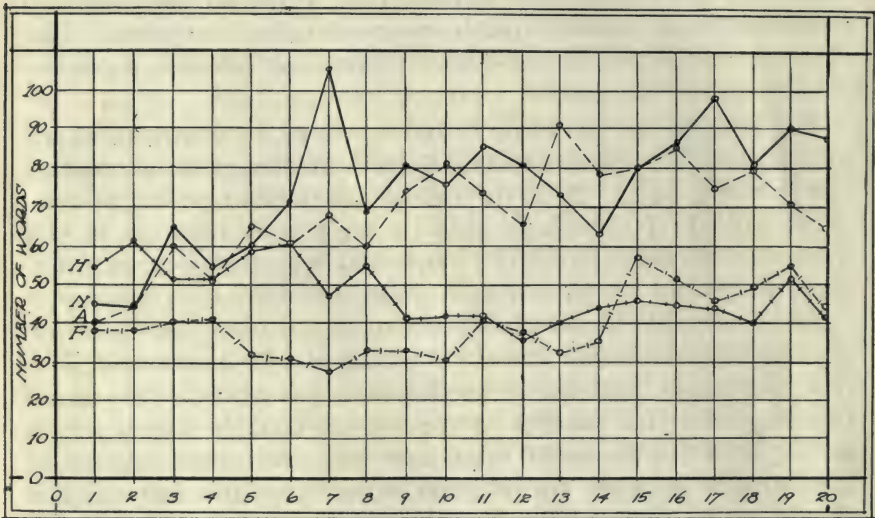


FIGURE I

## The Adolescent Will-Profile

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In the following report a presentation will be made (1) of the main points of difference between the median will-profile of a group of twenty-one high school freshmen and that of normal adults, and (2) of the differences in temperamental pattern found within the high school group itself.

In introduction it may be stated briefly that the will-profile<sup>1</sup> is a presentation by means of a graph of the scores from 1 to 10 received by an examinee on a series of ten tests (later increases to twelve) designed to throw into the foreground a number of character or temperamental traits. The norms were obtained from a ten-percentile grouping of results gained from examination of approximately 250 adults, ranging in age from seventeen to about fifty-five years. The comparison suggested above was instituted in order to determine the effect of maturity on the norms that had been established. But the results proved enlightening in other respects also, since they not only served to point out the ways in which the group in question varied in profile from the grown-up group but also indicated a method for profitable differentiation of the members of the group.

The ten traits measured were the following: Speed of Movement, (measured by writing-rapidity); Absence of Load or Inertia, (measured by the ratio of normal to speeded writing); Flexibility, (measured by success in disguising one's hand and by rapidity and skill in imitation of another hand); Speed of decision, (measured by the time taken in checking a list of character traits); Motor Impulsion, (measured by increase or decrease in graphic amplitude under distraction of attention); Assurance, (measured by reaction to contradiction); Resistance, (measured by reaction to opposition—writing is blocked by introduction of an obstacle); Motor Inhibition, (measured by the length of time that may be consumed in the writing of a given phrase); Care for Detail, (measured by the

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<sup>1</sup>For a detailed report, see *The Will-Profile, A Tentative Scale for Measurement of the Volitional Pattern*. Bull. 3, Department of Psychol., University of Wyoming, 1919.



time and care given to the imitation of graphic models); Coordination of Impulses, (measured by degree of success in fulfilling a double task, namely, writing in speeded time a given phrase on a short line). The two traits added to the list after the group to be reported on had been tested are Perseverance, (measured by the length of time spent in working out a disguised hand); and Revision, (measured by length of time spent in rechecking the list of character traits).

It is evident that the twelve traits listed fall roughly into three groups, of four traits each. The first group of traits (speed of movement, absence of load, flexibility, and speed of decision) emphasizes ease and fluency of reaction. The second group of traits (motor impulsion, assurance, resistance, and motor inhibition) emphasizes force of reaction. The third group (care for detail, coordination of impulses, perseverance, and revision) emphasizes precision and carefulness of reaction.

What degree of correlation will be found to exist between any trait and any other has not yet been accurately determined. There is, however, evidence of correlation of speed of movement and speed of decision; speed of decision and absence of load; flexibility and coordination of impulses. Detailed study of correlations may, in fact, suggest in the final revision a slightly different grouping of traits or it may prove of value in the establishing of subgroups within the main groups. It is possible, for example, that motor inhibition belongs with the last group of traits rather than with the central group, and that coordination of impulses is more closely related to flexibility than it is to care for detail.

In any case, study of actual graphs suggests a number of characteristic patterns. Three one-peaked patterns are possible; three two-peaked patterns; and, besides, a pattern that keeps fairly well to a given level. Fluctuating combinations are also found. The total score is of interest because indicative to some extent of the general level at which the pattern runs.

A one-peaked pattern occurs when relatively high scores are obtained for any one of the three groups of traits. Specifically, there may be three of these one-peaked patterns as follows: (a) an emphasis of the first four traits, indicative of a flexible ready type of reaction; (b) emphasis of the second group of traits, suggesting an aggressive vigorous type of reaction,—the will-ful type; (c)

emphasis of the last four traits indicative of a pondering deliberate type of reaction. Many profiles are two-peaked. High scores on the first group of traits (speed of movement, flexibility, absence of load, and speed of decision) may be combined with a high score on the aggressive traits (motor impulsion, assurance, resistance, motor inhibition), or the combination may be one of the aggressive traits with those that make for a deliberate stable reaction. Occasionally, one finds a pattern that runs high for speed and flexibility of reaction and also for care for detail and coordination of impulses, but with low scores for the more aggressive traits. When the graph maintains a fairly constant level it would seem indicative of a balanced pattern.

In instituting a comparison between the high school and the adult group, I plotted a profile, using as a score for each trait the median score for the high school group. (See Profile I.<sup>2</sup>) It will be seen that the medians for this group of twenty-one high school freshmen coincided with those of the adult group for the following traits: absence of load, speed of decision, motor impulsion, assurance, and resistance. The median score was low for the following traits: speed of movement, flexibility, motor inhibition, care for detail, and coordination of impulses. The pattern as a whole is that of the willful or aggressive type, with a partial emphasis of the first group of traits or those which relate to speed and fluency of reaction. The general form of the profile is of great interest since it exhibits the temperamental type with which the educator deals in his work with the high school freshman. Out of this specific combination of traits, such, for example, as high motor impulsion and deficient motor inhibition arise many of the disciplinary problems of this period.

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<sup>2</sup>With such a small group as the one with which we are dealing the propriety of utilizing the median in the way suggested may be questioned. But observation of the whole distribution of scores confirms our conclusions except, possibly, for three traits.

In every instance in which the group median of the high school pupils is definitely below the median for adult scores the range of scores is considerably cut at the higher end, that is, none of the group achieve the higher scores; usually, too, the mode is the same as the median, although this does not hold true in the case of care for detail. Where the median coincides with that of the adult scores, the distribution is fairly symmetrical except for motor impulsion and assurance. A bigger group is perhaps necessary for definite establishment of the central tendency.

But within the group itself several patterns may be differentiated. These individual profiles, by assisting in the analysis of individual differences, may be utilized in educational guidance in a most instructive way.

Incidentally, the plotting of these profiles, furnished in itself proof of the validity of the scale utilized in getting them.

Let us consider the group of high school freshmen in some detail. In chronological age, they ranged from thirteen years two months to fifteen eleven. The range in mental age was from thirteen years to some seventeen years. The I. Q.'s ran from .87 to 1.36. In addition to this information I had at my disposal for twenty pupils an order of merit based upon grades received in school work, and three arrangements for general intelligence made respectively by the high school instructors in science, modern languages, and mathematics.<sup>3</sup>

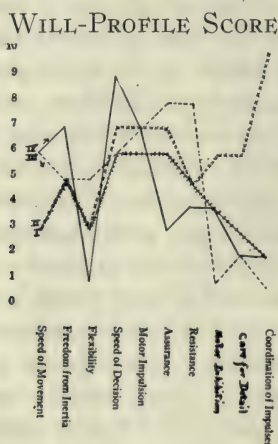


Plate I. Profile I. Red Median for high school group. Total score, 43.  
 Profile II. Boy, highest total score of group, 60.  
 Profile III. Girl, total score, 48.  
 Profile IV. Boy, total score, 44.

Plate I gives, in addition to the Profile for the median score of the group, three other profiles representing the scores made by three different students, whose records are selected for discussion

<sup>3</sup>Mr. Merton Willer, formerly instructor in mathematics in the University of Wyoming Training High School, furnished me with my accessory data, and in a number of cases with the I.Q. record. Before referring to the tables submitted by him I plotted the will profiles and in many cases made prophesies which were confirmed by the records at my disposal.



for very specific reasons. Let us first consider the profile (II) of the boy who gave the highest general score on the profile as a whole. This score totals 60; a much higher score than the median total, which is 43. On the face of the returns we have then a boy of more than average will-capacity. Specifically, he approximates the average of his group in speed of movement, absence of load, flexibility, and resistance; in every other trait he scores above the group-median. His relatively high scores are, however, at the extreme end of the graph. He excels, that is, in motor inhibition, care for detail, and coordination of impulses. This gives us a picture of a careful, dependable boy of great self-control. Let us now turn to the report on his case. So far as his I. Q. (1.09) is concerned he ranks ninth in the group of twenty; his grades entitle him to second place; his teachers agree in placing him sixth in the group. One's anticipations are confirmed. Such a student, because of his industry and volitional force, will accomplish more than can be accounted for on the basis of his general intelligence. He is the type of person who will put to use every atom of ability he possesses and will ultimately outdistance competitors of considerably more capacity so far as bare intelligence is concerned.

Profile III is obtained from another student—a girl this time—who also ranks higher relatively on the will-profile than in general intelligence. Her I. Q. of 1.02 gives her twelfth place in the group; her total score on the will-profile, 48, gives her a position of 7.5 for this ranking. Her pattern, however, is very different from the one just described as can be readily seen from a study of the graph. In speed and fluency of reaction this girl equals or exceeds the median of the group; and in motor impulsion, assurance, and resistance gives very high scores; but her record falls very low for motor inhibition, care for detail, and coordination of impulses. The picture this time is of a wilful determined type, lacking in control and stability. It is not surprising then to find her ranking fifteen for grades. Nor is it unexpected to find considerable difference of opinion in the ranking by teachers. The teacher of science gives her a rank of 7.5; the teacher of mathematics, a rank of 14; and the teacher of languages the same. An interesting bit of additional information should be added; the wilful nature of the girl makes her something of a problem in the home.

Profile IV affords another picture still. The high scores here are

for speed of movement and of decision, and for absence of load and motor impulsion. The scores on assurance and resistance are, qualitatively, those obtained by tactfulness and suggestibility of reaction. The impression received is that of a quick-reacting, animated, and impulsive but not forceful individual. Analyzing this profile I wrote, "With good intelligence this subject should make a good impression; with poor intelligence he will appear flighty and unreliable." Recourse to the tables confirmed my expectations. Since his I. Q. proved to be high, 113, I anticipated a favorable judgment of his intelligence on the part of his instructors. Two rank him 4.5; the other, 5.5. The rating otherwise is follows: I. Q. rank, 7; Will-profile rank, 12; rank for grades, 5. I suspect, although I have no reason other than my analysis of the general situation, that in this particular instance high grades might be determined as much by the general impression of intelligent assimilation as by actual work done. In my study of the will-profiles of adults I have a number of clear-cut instances of a comparable pattern producing a generally favorable impression, at times certainly in excess of what would be warranted by actual intelligence. The high points in such a pattern fall at speed of movement and of decision, absence of load, motor impulsion, and, usually, flexibility, in combination with a tactful reaction to the contradiction test.

The above analyses are probably sufficient to show the uses to which the Will-Profile may be put. In further illustration I may give the profile of the child with the highest I. Q., who is chronologically the youngest and mentally the oldest of the group. Her total score on will traits is 55, considerably above the group median. Her grades place her first in the group and in the opinion of the instructors in science and mathematics she has the highest general intelligence of the class. Her instructor in French places her second. Plate II, Profile V, shows her pattern of reaction. She belongs to the quick-reacting aggressive type. At present she is below the median of the group for power of motor inhibition and in care for detail. If mental maturity, rather than chronological age be considered, she is definitely short on these traits. She is, in fact, an excitable, nervous, very charming girl, with a slight speech defect. Her training should seek to develop calm and poise.

On the same plate is plotted the will-profile (VI) of the member of the class with the lowest I. Q. (.87). Mentally he does not quite

make thirteen years. His grades give him eighteenth position among the twenty. His science teacher ranks him sixteenth in the group, but the other two instructors place at the end or next to it. Apparently he is utilizing what capacity he has, since he is more than holding his own against his neighbors in the group who rank quite a little higher in general intelligence. His profile indicates a slow-reacting but tenacious temperament which may bring him a measure of success if he decides upon the right sort of life work and is given careful training for it.

WILL-PROFILE SCORE

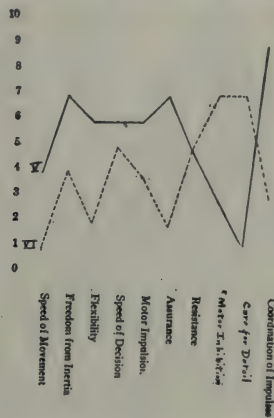


Plate II. Profile V. Girl, chronologically youngest, mentally oldest of group. Total will-score, 55.

Profile VI. Boy, lowest I.Q. of group. Total will-score, 37.

The general effect of the temperamental or will pattern on the grades received in school would be largely determined by the specific form of the pattern. Great care for detail and power of motor inhibition might be expected to issue in high grades. An hair-trigger organization might give a contrary effect. In this group of high school students the correlation of I. Q.'s and grades was  $+.84$ ; of Will scores and grades,  $+.72$ . With one exception, the individual school records are illuminated by a study of the will-profile in conjunction with the I. Q. In this particular case a normal I. Q. and a fair will-profile fail to explain the boy's somewhat checkered school career. Possibly, the home-environment is the factor at fault.

The specific influence of age and intelligence on the will-profile remains yet to be determined precisely. As we have seen, maturity



as exhibited by adults in contrast to high school freshmen is certainly influential in raising the scores on such traits as speed of movement, motor inhibition, flexibility, care for detail, and co-ordination of impulses. But not only the chronological, but the mental age also, may be influential in determining scores. To estimate the effect of mental age in contrast to chronological, a detailed study should be made for groups (a) of the same chronological age but of different mental ages; and (b) of the same mental age but of different chronological ages. At present, I do not have sufficient material for instituting such a comparison.

The general question as to the relation of general intelligence to the total score on the will-traits must be disposed of briefly. With this group of high school subjects a high correlation is found for a ranking on the basis of the total score for the will-profile and a ranking based on the I. Q., namely  $+.77$ . But with a group of college girls no such correlation of score on the will-traits and total points made in the Army Alpha examination was found. Some complication with maturity may be involved which it is not possible to disentangle with the material at our disposal. Quite possibly mental age, as indicative of mental maturity, and mental age, as indicative of degree of intelligence, need to be differentiated.

On the whole, after a given degree of comprehension is reached, intelligence would not seem a very significant factor in the will test. Below a certain point, slowness in comprehension might retard the checking of character traits and make it difficult for the subject to understand what is required in a handwriting disguise. But these tests are exceptions. A fair total score on the Will-Profile may be obtained even from feeble-minded subjects.

## COMMUNICATIONS AND DISCUSSIONS

### CLASSIFICATION OF JUNIOR HIGH SCHOOL PUPILS BY THE OTIS SCALE

UNLESS subject matter is adapted to the mental ability or learning capacity of pupils, it can have very little educative value for these pupils. If classes are not classified according to their mental ability it is practically impossible to present subject matter in such a way that the majority of the class may grasp it. In the average recitation there can be found three and perhaps four distinct groups of pupils.

Otis describes three groups :

First, there are those to whom the conduct of the recitation seems fairly well adapted. They give good attention and learn moderately well. Second, there are the pupils who do not seem to be able to keep up with the discussion ; when questioned they show difficulty in grasping the fundamental points of the lesson. Such pupils, indeed, may have "passed" in the work of the previous grade. Very likely they show lack of interest because of lack of understanding, and often give up trying to follow. They then either fall into a sort of dreamy state or listen hopelessly while the discussion passes entirely over their heads. Subsequent individual instruction is often necessary to enable them to continue with the subject. Third, there are the pupils who understand the teacher's first explanations. Often they are not given an immediate opportunity for self-expression, but are compelled to listen quietly while a second or third detailed explanation is given for the benefit of the less intelligent pupils. These pupils then either sit in a state of greater or less boredom or cast about for some mischief in which to expend their surplus energies.

It is becoming a well-recognized fact that a pupil who falls in the first group in one subject tends to fall in the group in all subjects, and that the same is true of pupils falling in the second or third groups. There may be, here and there, marked exceptions to the rule, but it is true in general. One is naturally led to the conclusion, therefore, that the pupils of the second type mentioned simply lack the general mental capacity to assimilate knowledge as rapidly

as the other pupils, though their having passed the grade below would seem to indicate that if given sufficient time they could understand the subjects under discussion, at least fairly well. One is led to conclude also that the pupils of the third type mentioned possess a degree of native mental ability which enables them to acquire knowledge more rapidly than do their fellows.

This being the case, if it is possible to teach the "bright" pupils separately, so that they might progress as rapidly and to as great a degree of achievement as their capabilities would permit, then a great injustice is done them by holding them to the lockstep of the middle group. It is to these exceptional children that the nation must look for the creative genius and leadership by means of which society may evolve a greater civilization. Similarly, if the "dull" pupils could be taught separately at a slower rate of progress, which would permit them to keep up with the discussions, take an interest in the subjects, and learn all that their capabilities permitted, then, similarly, a great injustice is done these pupils by permitting them to more than waste their time in dragging through what is to them unintelligible discussion and to acquire the "habit of failure." The almost inevitable outcome of such maladjustment in the premature quitting of school and the consequent misfortune of a half-finished education accompanied by a feeling of malevolence toward the school and society.

The writer has given the Otis Scale to 397 junior high school pupils and has classified them in classes according to their I. Q's. The teachers estimate at times played some part in the classification. With some exceptions it looks as if there might be a close correlation between the teachers' estimate and the I. Q's. A study is being made of this problem at the present time.

Otis classifications of I. Q's is as follows:

Above 140 near genius.

120-140 very superior intelligence.

110-120 superior intelligence.

90-110 normal.

80- 90 dull.

70- 80 borderline.

Below 70 feeble-minded.



Distribution of I. Q's .....	397 cases
Above 140 .....	12.5%..... 49 cases
120-140 .....	18.7%..... 74 cases
110-120 .....	10.8%..... 43 cases
90-110 .....	27.2%..... 108 cases
80- 90 .....	16.8%..... 67 cases
70- 80 .....	7.8%..... 31 cases
Below 70 .....	6.3%..... 25 cases
Percent of cases above Normal	42%.
Percent of cases Normal	27.2%.
Percent of cases above Normal and Normal	69.2%.
Percent of cases below Normal	31%.

The high percent of feeble-mindedness is due to the large number of retarded negroes. Fifty-seven negroes are enrolled and seventeen of this number or 29.8% are feeble-minded according to the Otis Scale. Eight out of three hundred forty white pupils are feeble-minded or 2.3%. In our Junior high school we have three rather distinct groups of pupils. The normal and accelerate group who will very probably continue their education beyond junior and senior high schools. The second group, a large percent in the "dull" classification, have made somewhat normal progress through the elementary school and will very probably stop school before they reach the senior high. The third group are mature pupils, who are retarded three and four years, and have not completed the elementary school, but who have been placed in junior high school and allowed to pursue subjects which their abilities and interests may permit. This accounts for the rather large percent of probable and definite feeble-mindedness. With these three groups in Junior high school, classification by the Otis Scale simplifies matters of discipline—subject matter and methods.

Two years comprise our Junior high school course. In the first half of the first year we have ninety-one pupils and these were classified into three classes according to the I. Q's as follows:

Class I — 112 to 140 and above .....	33 pupils
Class II — 87 to 110 .....	32 pupils
Class III—Below 70 to 80 .....	26 pupils

In the second half of the first year we have one hundred and six pupils. This group was divided into four classes according to the I. Q's as follows:

Class I —120 to 140 and above .....	29 pupils
Class II —100 to 120 .....	30 pupils
Class III— 80 to 100 .....	27 pupils
Class IV—Below 70 to 80 .....	20 pupils

In the first half of the second year we have eighty-four pupils. This group was divided into three classes according to the I. Q's as follows:

Class I —120-140 value .....	20 pupils
Class II — 90-120 .....	29 pupils
Class III—Below 70 to 85 .....	29 pupils

In the second half of the second year we have one hundred sixteen pupils classified according to the I. Q's as follows:

Class I —120 to 140 and above .....	29 pupils
Class II —107 to 120 .....	29 pupils
Class III— 88 to 105 .....	31 pupils
Class IV—Below 70 to 80 .....	27 pupils

The point of division between any two groups is arbitrary and is determined largely by the size of the group. There will naturally be some over-lapping between the groups. The writer feels that the distinguishing feature of the Otis Scale is in classifying the normal and lower end of intelligence, the dull, borderline and feeble-minded.

The grouping must be flexible and whenever a pupil does a better piece of work than the standard of his group he is placed in a higher group and likewise when a pupil fails to do the work of his group he is placed in a lower division.

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# THE CORRELATION OF GENERAL INTELLIGENCE TESTS AND SCHOOL STANDING

THE following is a report on the results of the Army Alpha test, given approximately a year ago, which may be of some general interest and a possible contribution to the very important problem of correlation between general intelligence and school standing.

The writer gave the Alpha test to juniors and seniors in the Millersville (Pa.) State Normal School and, after dropping those cases having no previous Normal School record, had left 153 individuals (mostly women). The school standing was worked out for each of these individuals and the coefficient of correlation was found between their general intelligence standing and the school standing.

The school standing was obtained by taking the average of the final marks made by each student for one term. It is possible that it would have been better to take the school standing over a longer period of school life, but this was the best we could do at the time. Whether this seriously affects our results is a question, though we do not believe that it does. Yet in the absence of any adequate explanation for the very low correlation found, this factor may play some part.

The following quantative results were found:

$r=+.31=.039$  (Pearson's Product-Moment Formula).

Standard Deviation G. I.=28.2.

Standard Deviation S. S.= 6.1.

Mean G. I. score=117.1 Points.

Mean S. S. grade=81.00 (% basis).

The following table shows a rough picture of the distribution of individuals according to their relative places in school and intelligence classes.

INTELLIGENCE STANDING		SCHOLASTIC STANDING			
		A Students	B Students	C Students	D Students
No.	Class	No.	No.	No.	No.
28	A	6	17	5	..
80	B	5	43	29	3
39	C Plus	..	18	19	2
4	C	..	1	3	..



Why we have obtained such a low correlation is difficult to explain. We cannot blame the grading system, for the Normal School upholds a good standard. The fact that the majority of the individuals tested were women may be significant, for the Army tests are tests especially for men. Yet this has been the case in many schools where the tests were given and which reported better correlation. The fact that school standing is based upon one term of school work may have something to do with the results. Again, it might signify some truthfulness to the notion expressed by Stern.\* "Complete agreement between school ability and intellectual ability is not to be expected at all, nor even to be desired, because performance in the school depends not only upon intelligence but upon certain other quite different factors." As a matter of fact some investigators find very satisfactory correlation between general intelligence standing and school standing, while others find very low correlation. It is time for a complete summary of all work done as to correlation between general intelligence tests and school standing, for the kind of coefficient of correlation found here is of great significance. The gathering and comparing of this data the writer has started but, as yet, has only made a start. In the data we have, we find most conflicting results.

We believe that the mental tests are by far the best means we have at present for sorting out students and predicting their future. But to say that our tests have decided limitations is to state the obvious. We would like a complete profile of the boy or girl examined. An individual may be extremely lazy, a shirker, and yet be "very superior" in general intelligence. He may have no "stick-to-it-iveness," no ideals, and yet stand high intellectually. The emotional life of the individual is little touched by the tests. The intelligence ratios are subject to change also, as Miss F. Mateer has shown.†

We have, in our limited use of the more prominent mental tests during the last four years, found illustrations of each of these statements. No one would think of branding a child as feeble-minded until many other factors besides the bare intelligence rating had been taken into consideration, as heredity, training, environment, disease history, sense-organ conditions, etc.

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\*Psychological Methods of Testing Intelligence.

†*The Diagnostic Fallability of Intelligence Ratios.* Ped. Seminary, Dec. 1918.

We do not wish to magnify exceptional cases nor do we wish to assume a destructive attitude. Only as we recognize these limitations can we remove them. The child or the man is a many-sided creature, and these many aspects must be adequately tapped before our system of tests, mental and physical, can be thought of as in any sense complete. For diagnostic and prognostic purposes the tests have many weak points, undoubtedly, but that they serve a good function now that they are better than any past hit-and-miss methods of the pedagogue, is beyond question.

E. B. SKAGGS.

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#### A NEW SILENT-READING TEST

A new form of silent reading test has recently been devised at Indiana University by Mrs. S. L. Pressey. The test consists of paragraphs in each of which there is a word which spoils the meaning of the paragraph or makes a false statement (*e. g.* "The men in the shoe factories in the East have been striking for shorter hours, lower wages, and a recognition of their union"); the children are told to cross out, in each paragraph, the wrong word. The development of the test has also involved certain unusual features. In the first place, the scale is being compared with other reading tests by correlation of each test with an independent statement of ability in reading, based on pooled ratings as to reading ability from four teachers for each child in a large Junior high school. Finally, rate score and comprehension score are being combined into a single score in silent reading by means of the partial regression equations of rate score and comprehension score on reading ability, as thus judged. This last step—the scientific combination of the two scores into a single statement—is felt to be a particularly important feature of the work.

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## EDITORIAL

IT WAS quite natural that the earlier work in educational measurements should have been with the elementary school subjects. These subjects are simpler and more definite; they lend themselves more readily to analysis; they apply to a larger number of pupils; they came more particularly within the purview of the early school surveys; there was more of a popular demand to determine exactly the results of instruction in this field. And yet just because of the greater freedom allowed pupils in the selection of courses, just because of the difference in standards of attainment in different schools and classes there is the greater need for a thorough and vigorous prosecution of experimental studies in secondary schools. We need scales and standard tests in every high school subject to aid in the administration and supervision of high school work, to help the teacher attain more precise aims in the details of the work, and to give the pupil an objective standard so that he may become more clearly conscious of his strength and



weakness, and may put the effort where it will be most significant.

There are indications that high school authorities are beginning to realize this need and are taking measures to satisfy it. The recent increase of interest in group tests of intelligence, and the rapid multiplication of these tests have stimulated many high school principals to experiment with them as guides to the classification of first term pupils. Others are trying intelligence tests and tests of various sorts to help in determining whether a given pupil gives promise of success in a given line of study, as foreign languages, for example. But all such pre-determination tests suffer from the lack of adequate measures of success in the subject itself, and from the lack of analysis of the factors that contribute to such success. What is urgently needed at the present time is a series of reliable scales in each secondary school subject to be used in measuring the attainments of pupils at each step of their advancement. Such measures should include both range of information and readiness to meet new situations in the field of the subject.

Much work has been done on English composition and some on English grammar, but the tests and scales in these fields have all been developed from the point of view of the elementary schools. Other scales need to be worked out here in accord with the aims of the high school teacher of English. A scale of familiarity with standard literature is very much to be desired. Excellent work has been done by Rugg, Hotz and others in developing scales for elementary algebra, but there is much need for comparative studies of these scales on the same groups of pupils to determine their relative advantages in point of ease of administration and scoring, diagnostic value for the teacher, and helpfulness for the pupil. There are as yet no scales in plane geometry. The tests of Stockard and Bell, of Minnick, and of Starch contain valuable suggestions, but they still await organization into a usable scale. In foreign languages there has been much activity in the past few years, and we now have some excellent scales in Latin, and some promising preliminary work in French and Spanish. In history Van Wagenen has recently done some good work, but the fields of medieval and modern European history and of English history have not been touched. The whole territory of the sciences is practically unexplored, and little or nothing has been done in commercial and technical fields. Thus it will be seen that only a beginning has been made in measurements of high schools subjects, and intensive investigations are urgently called for.

J. C. BELL.

## NOTES AND NEWS

At the meeting of the New York Society for the Experimental Study of Education, held February 20, the general topic of discussion was "Problems in the Teaching of Modern Languages in High Schools." Mr. M. A. Luria, of DeWitt Clinton High School, recounted his "Experience with Prognosis and Predetermination Tests." "Before any valid prognosis test can be devised there will have to be a breaking up of the aims in modern language instruction, a consideration of the fact that pupils eventually acquire a foreign language in certain phases only, and finally a series of standard tests will have to be perfected which will remove the personal element in determining a pupil's linguistic achievement." Mr. Waldemar Dorfman, Stuyvesant High School, discussed "Recent Psychological Tests in Modern Languages," with especial emphasis on the Briggs-Kelley tests, the Otis tests, the Handschin tests, and the Wilkins tests, as worked out in New York City. Mr. William M. Barlow, Curtis High School, spoke of "Vocabulary Limitations," stressing the difference between active and passive vocabulary, and urging the experimental determination of standard active vocabularies in each language for each term's work. The discussion was summed up by Mr. Lawrence A. Wilkins, director of modern languages in New York City high schools.

The provincial government of the District of Catalonia, in Spain, has invited Dr. Montessori to assume official direction of "scientific puericulture" within its area. She is to be given a free hand in administration and method alike, to be allowed as many years free from interference as she may require, and to have all facilities put at her disposal for any and all lines of research. Both urban and rural conditions will be open to her as a laboratory.

The British prime minister has appointed a committee "to inquire into the position to be assigned to the classics (i. e., to the language, literature and history of ancient Greece and Rome) in the educational system of the United Kingdom, and to advise as to the means by which the proper study of these subjects may be maintained and improved."

At the December meeting of the American Psychological Association a committee was appointed to formulate standards for the qualifications and certification of practicing psychologists for the United States. The committee consists of Professor Bird T. Baldwin, State University of Iowa, chairman; Professor Walter F. Dearborn, Harvard University; Professor Leta S. Hollingworth,



Columbia University; Dr. Helen T. Woolley, Vocational Guidance Bureau, Cincinnati; and Dr. Beardsley Ruml, The Scott Company, Philadelphia. State departments of education contemplating the certifying of psychologists should consult with a member of the committee. New York, Wisconsin, New Jersey and California recently legalized practising psychologists.

Professor C. H. Handschin, of Miami University, Oxford, Ohio, has recently published with the World Book Company a series of modern language tests in French and Spanish. There is a silent reading test, A, in each language, constructed somewhat on the principle of the Kansas silent reading tests in English, all answers to be expressed in words in the foreign language. In each language there is also a connected prose passage, B, the comprehension of which is determined by the answers given to ten English questions, the answers to be given either in the foreign language or in English as the pupil prefers. There is also a French comprehension and grammar test, in which the pupil carefully studies six easy French sentences for five minutes, and is then asked first to reproduce the sentences, and then to give them in the third person plural, past indefinite tense. Methods of scoring and tabulating are carefully indicated.

Professor David Camp Rogers, of Smith College, has issued a 32-page pamphlet containing eleven group tests of intelligence which have been given to 480 girls of the freshman class. The tests are as follows: 1. Logical conclusion test. 2. Delayed recall of the ideas in a passage read at the beginning of the period, in answer to questions asked toward the end of the period. 3. Range of information test. 4. Solution of arithmetical problems. 5. Immediate recall of ideas in a descriptive passage. 6. A digit-letter substitution test. 7. Similar relations test. 8. Completion test. 9. Absurdities test. 10. Following directions test. 11. Train of associations test. The results from these tests should be very interesting.

Dr. W. V. Bingham, chairman of the division of anthropology and psychology of the National Research Council, announces the approaching publication of a series of tables to facilitate the computation of  $\rho$ , the coefficient of correlation by the rank order method. These tables have been prepared by the Scott Company Laboratory, Philadelphia, and will be of great value to any student who has many correlation computations to make.



Last fall the War Department entered upon a program of training for the enlisted men of the army including both general education and vocational subjects, and intended to achieve the following purposes: 1. To train technicians and mechanics for the special services of the army, and to raise the general standard of intelligence of the enlisted personnel in order to increase military efficiency. 2. To prepare the men for return to civilian life, upon the termination of their periods of enlistment, with occupational training that will render them economically independent, and with a clear understanding of their social and industrial relationships. The courses of instruction in the army schools are grouped under two main divisions: General education and vocational training. Under the first division are included all of the more important subjects commonly taught in the public elementary and high schools, as reading, spelling, writing, arithmetic, history, geography, and civics. The vocational work is organized under seventeen principal departments, with a total of 116 different branches of instruction now listed. The special service school includes, in addition to the general education and the vocational training sections, a section of tests and standards, whose duties are to develop practical methods for testing the men in the army schools, and to set up standards of progress in the various subjects of training. Specifically, the section of tests and standards aims to perform the following functions: 1. To devise a simple test of literacy for the classification of recruits. 2. To devise tests for the measurement of proficiency in arithmetical operations and in the understanding of language, for purposes of classification and assignment to courses in general educational and vocational training. 3. To devise tests for measuring the degree of trade proficiency of men who claim to have experience in industrial occupations. 4. To devise tests of general mental ability, similar to the Army Intelligence Tests, but more directly adapted to measuring the men now composing the army. 5. To devise uniform methods of measuring the progress of men in the several courses of training. 6. To devise methods of determining as definitely as possible the total amount and quality of the student's performance upon completion of his training, for the purpose of certifying him for industrial employment or for advanced training. The organization of this work is in the hands of Dr. D. Edgar Rice, consulting expert, section of tests and standards.

Dr. Elmer Ernst Southard, Bullard professor of neuropathology at the Harvard Medical School, director of the Boston psychopathic hospital, died from pneumonia in New York City on February 8, at the age of forty-four years.

## PUBLICATIONS RECEIVED

J. REMSEN BISHOP. *Measurement Tests in First-Term Geometry*. First Year-Book, National Association of Secondary School Principals, 1917. Pp. 50-56.

After some sharp criticism of the educational measurement movement, its aims and methods, the author proposes ten questions in plane geometry, and gives the percentage of correct solutions obtained from the boys and girls of his school who had just finished the first term of geometry. The boys averaged 55 per cent., while the girls averaged only 38 per cent. The teachers' marks given to these pupils on their term's work averaged about 48 per cent. The author adds three sets of questions that he thinks will be serviceable both for test and for practice purposes.

HERBERT CARRINGTON. *Modern Psychical Phenomena*. New York: Dodd, Mead and Company, 1919. Pp. xv, 331, \$2.50.

With the present recrudescence of interest in the occult this book should have a wide appeal. It is vastly better than most books on psychic phenomena, for the author knows psychology and is disposed to explain the alleged phenomena on psychological principles. At the same time he professes to believe in telepathy (though he is unable to say what it is), and asserts roundly that genuine materialization (whatever that may be) is a fact in nature. Part I treats of the relation of physical phenomena to evolution, psychology, biology and ethics; Part II gives an account of recent experiments and theories; and Part III describes researches in crystal vision and crystal gazing.

ARTHUR HENRY CHAMBERLIN AND JAMES FRANKLIN CHAMBERLIN. *Thrift and Conservation: How to Teach It*. Philadelphia: J. B. Lippincott Co., 1919. Pp. 272. \$1.50.

That there may be universal understanding of what thrift is—personal, community and national—the subject must be taught in the schools. The Committee on Thrift Education of the National Council of Education has been studying the best methods of accomplishing this, and its Chairman, Arthur Henry Chamberlin, now offers this authoritative guide to the educational world. Among the chapter subjects are thrift and the national life, true and false economy, waste, food, dress, time, human resources, increasing the food supply, conserving the soil, the value of forests, our mineral fuels, national health, use and misuse of money, and the use of public property; with subdivisions of important subjects. This is not only an authoritative guide to the teaching of individual and national

thrift, but a book which will appeal through its inherent interest and the skill with which the subject is presented. It is earnestly commended to the educational world.

PADRAIC COLUM. *The Children's Homer: The Adventures of Odysseus and the Tale of Troy.* New York: The Macmillan Company, 1918, Pp. ix, 254. \$2.00.

This is the first attempt to combine in one volume the stories of the Odyssey and the Iliad. As is fitting in a Homer intended for young people the work opens with the youth Telemachus who is moved to go in search of his father. He hears from the minstrel of his house and afterwards from Menelaus, Helen and Nestor, the stories of Achilles, Hector and Odysseus. In this way the Iliad is presented. Afterwards the tale is taken up with the adventures of Odysseus on his way back to his own land and the whole of that enchanting narrative is retold. The diction of the narration is simple, direct and dramatic. Padraic Colum makes this Children's Homer at once intimate and spirited. The charm of the tale is greatly enhanced by the splendid drawings of Willy Pogany. There is scarcely a page that does not show the touch of the artist's pencil, and there are eight full page illustrations in color.

*A Co-operative Study of Reading in Sixteen Cities of Indiana.* By Bureau of Co-operative Research, Indiana University School of Education. Indiana University Studies, No. 37. June, 1918. Pp. 43. Thirty-five cents.

This monograph gives a detailed account of the application of the Gray Oral and Silent Reading Tests to 4,780 pupils in Indiana schools. The tests, directions for use, and methods of scoring are presented in detail, the scores for both oral and silent reading are presented in tabular and graphic form, and there is an elaborate discussion of each set of results. Indiana cities are distinctly below Grand Rapids, Cleveland and St. Louis in oral reading, and are also low in the comprehension of silent reading. There are striking differences between schools.

JOHN J. COSS AND LEONARD OUTHWAITE. *Personnel Management. Topical Outline and Bibliography.* Washington: Adjutant General's Office, 1919. Pp. 59.

This is a valuable bibliography of the rapidly growing literature on the selection of individuals for specific positions. The list of references is by no means complete, but is fairly representative, and is conveniently organized.



LAWRENCE A. WILKINS. *Spanish in the High Schools*. New York: Benjamin H. Sanborn and Company, 1918. Pp. x, 264.

The sub-title to this excellent manual is "A Handbook of Methods, with Special Reference to the Junior High Schools." The opening chapters discuss the increasing demand for Spanish in American education, the aims in teaching Spanish, the present attitude toward Spanish in the schools, and the preparation of the teacher. There follow chapters on methods in teaching the language, the course of study for junior high schools and its relation to the work of other schools, the organization of classes, the conduct of the recitation, practical suggestions to the teacher, club work in Spanish, the qualifications and handicaps of the teacher of Spanish, and the value of Spanish as a foundation for the study of Latin. There is an excellent working bibliography for both teachers and pupils. With the extended use of this valuable handbook the teaching of Spanish will rapidly rise from the Cinderella of modern languages to the rank of princess which it may justly claim.

J. HAROLD WILLIAMS. *A Guide to the Grading of Homes*. Whittier State School, Department of Research, Bulletin No. 7, 1918.

Reproduces the author's scale for grading home conditions, gives the record blank used by the Whittier Department of Research, and discusses in detail the points that are apt to arise in the use of the scale.

J. HAROLD WILLIAMS. *The Intelligence of the Delinquent Boy*. Journal of Delinquency, Monograph 1, 1919. Pp. 198.

This excellent monograph presents the results of an intensive study of 470 delinquent boys, most of them at the Whittier State School. They are classified into five groups, superior, average-normal, borderline, and feeble-minded. Over half the boys fall in the last two groups, and only 14 are found in the superior group. This bears out the contention that delinquency and mental deficiency are closely associated in a large proportion of cases. The characteristics of each group are described, and several illustrative cases are recounted in detail. There is also a classification by offenses and by racial differences. There are further chapters on heredity and the home in relation to delinquency. The monograph is of great value for those school people who have to deal with cases of delinquency among pupils.

WESTEL W. WILLOUGHBY. *Prussian Political Philosophy*. New York: D. Appleton and Company, 1918. Pp. xi, 203. \$1.50.

This is a clear and dispassionate examination of the political principles which made Germany a menace to democracy wherever that form of government existed. It throws into sharp contrast the two conflicting theories of government, absolute sovereignty on the one hand and the law of the people on the other. The author describes, against the background of a masterly exposition of American political ideals, the development of the Prussian theories and machinery of statecraft, and the means whereby the German political conscience was educated to the acceptance of absolutism as the true expression of sovereignty. An appendix describes the liberalization under the guidance of Prince Maximilian of Baden to which the Imperial autocracy was driven by impending military disaster, and which seems from the recent elections to be regaining the ascendancy.

JOHN R. WILSON. *Annual Report of the Board of Education, Paterson, New Jersey, for the Year Ending June 30, 1918*. Paterson: Board of Education, 1919. Pp. 290.

The important part of this report is the account of the survey of the Paterson schools under the direction of Professor George D. Strayer and associates from Teachers College, Columbia University. The buildings were scored by the Strayer score card, the light conditions in typical rooms were determined by the illuminometer, and the achievements of the pupils were measured in composition, handwriting, spelling, arithmetic, language and reading. The compositions were measured by the Nassau County Supplement to the Hillegas Scale, and the results are compared with the Trabue standards and the scores from thirteen other cities. On the whole the Paterson scores are somewhat lower than those from other cities. The distribution of the scores by grades will prove helpful to other surveyors. In handwriting the Thorndike scale was used, and again we find the same wealth of detailed information about the distribution the scores. In spelling a selection from the Ayres Scale was used, and not only is there a detailed presentation of the distributions, but also the percentage of accuracy for each grade on each word. In arithmetic the Woody tests, Series B, the Courtis tests, Series B, and the Stone reasoning tests were used, and the results are given with the usual meticulous consideration for details. In reading the Thorndike Scale Alpha 2 was used and in language the Trabue language completion tests. The survey is a model of what such reports may be in the way of helpfulness both to the practical school man and to the scientific investigator.

## THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

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### Mental Tests as a Means of Selecting and Classifying College Students

AGNES L. ROGERS

*Goucher College.*

IN March and April, 1919, a series of mental tests was applied to a group of 98 Seniors and 182 Freshmen at Goucher College. The purposes in view were threefold:

(1) to determine their reliability as measures of mental capacity for college women.

(2) to weigh their worth as indices to future academic success.

(3) to establish in the event of their proving satisfactory in the foregoing respects adequate standards both for the selection of candidates for admission and for the classification of entrants in the various divisions of the larger courses, required and elective, in accordance with capacity.

The tests were applied by the writer to both Seniors and Freshmen simultaneously in one large group of three hundred students approximately. The tests were distributed and collected and general supervision was exercised by ten other college instructors.

The Thorndike test of Mental Alertness<sup>1</sup> was used along with the Roger's Interpolation test<sup>2</sup> and the Rogers' Reasoning<sup>2</sup> test. Series

<sup>1</sup>The Thorndike Mental Alertness Test with instructions for giving and scoring can be obtained from the Bureau of Publication, Teachers' College, Columbia University.

A of the former was applied in March and Series K in April. Alternative forms of the other tests were likewise given on the second occasion. The Thorndike Tests are comparable in general character to the Army Scale Alpha. An enumeration of the names of

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<sup>2</sup>A description of these tests and their method of application and scoring is given in *Experimental Tests of Mathematical Ability and Their Prognostic Value*, Teachers College, New York City, 1918.



the tests included will indicate the extent of similarity between them. They are as follows: the first is a directions' test; the second, a series of disarranged sentences; the third, an arithmetic test consisting of a series of reasoning problems; the fourth, an arithmetic test in the four fundamentals; the fifth, an information test; the sixth, a synonym-antonym test; the seventh, a selective judgment test in which the task consists in indicating which of four things should be done in a given situation or which of four alternatives is the cause of a given course of action; the eighth, an interpolation test; the ninth, an analogies test; the tenth, a test in which the task consists in perceiving and indicating the largest and smallest numbers in a series of columns of numbers; the eleventh, a test in the detection of absurd statements; the twelfth, a test in logical inferences; the thirteenth, a test in the recognition of spatial forms.

These had been applied to candidates for Officers' Training Schools for the Air Service. They also were used as one feature of the Emergency Admission plan of the S. A. T. C. and seemed better adapted a discrimination between higher degrees of ability than the Army Scale Alpha. Their power to determine the mental level of individuals of superior mentality had already been partially demonstrated, and tentative standards for the particular groups examined had been determined. They were, therefore, applied now with the expectation of their proving a reliable means of measuring general mental alertness and aptitude for college work.

Another conspicuous advantage of these tests was that there were available fifteen duplicate copies, genuine alternative forms, equal in difficulty, but differing in content, thus making it possible to repeat the application on generations of Freshmen over a period of years and facilitating the standardization of norms for college women. The tests will be re-applied with such improvements as this application suggests at Goucher College, in October, 1919. This article therefore describes only one stage of the investigation, on which further reports will be published later.

Each application of the entire group of tests occupied 45 minutes. The conditions under which the tests were administered, though comparable to those used in applying the tests to candidates for army schools, seemed to the writer to fall short of what the object in view demands. In order to secure reliable measures of individual

ability the groups tested should be smaller. Where three hundred persons are examined simultaneously, the discipline must inevitably become more rigorous and consequently more emotionally disturbing. While it is true that more than merely intellectual functions are represented in the scores derived from tests of intelligence, it is nevertheless desirable that we should approximate as closely as possible to customary examination conditions and accordingly groups not exceeding 50 should be examined together. The reliability coefficients obtained would probably have been greater, if such conditions had prevailed. When calculated by the Pearson method, they were, however, as indicated in Table I.

TABLE I.

	Seniors		Freshmen	
	r1	r2	r1	r2
Thorndike Test of Mental Alertness, .....	.76	.86	.66	.80
Rogers Interpolation Test, .....	.76	.86	.75	.86
Rogers' Reasoning Test, .....	.54	.70	.52	.68

r1 is the reliability coefficient or coefficient of correlation between the two applications of the tests.

r2 is the reliability coefficient for the two applications combined.

$$r2 \text{ equals } \frac{2r1}{1+r1}$$

These coefficients cannot be considered satisfactory, particularly when it is remembered that our ultimate aim is individual measurement. Even if we admit that greater reliability coefficients would result from improved conditions of administration, still a more trustworthy gauge of the capacities tested seems necessary. The very brief period of testing is a partial explanation of the imperfect character of the tests as measuring rods. Their reliability would be increased by merely extending the duration of the time of testing. To determine to what extent these same tests would need to be lengthened to produce reliable results, use was made of the formula suggested by Brown<sup>3</sup>, namely  $rn = \frac{nr_1}{1 + (n - 1)r_1}$ .

In order to obtain a reliability coefficient of .95, the Thorndike test, if applied under similar conditions, would have to be extended to six times its present duration, that is six of the forms would have to

<sup>3</sup>BROWN, WILLIAM. *The Essentials of Mental Measurement*. Cambridge University Press, Cambridge, 1911. 101-102.

be given and the results pooled to secure such a measure of the student's ability as would yield a reliability coefficient of .95. Similarly for the Rogers' Interpolation, a test six times as long would be required for college women, whereas in the case of High School Girls, examined in smaller groups, a reliability coefficient of .94 was obtained from this test.<sup>4</sup> For the Reasoning test apparently at least sixteen applications would be necessary, although when applied to High School Girls, this test yielded a reliability coefficient of .73.<sup>5</sup> Thorndike's claim that "about 30 minutes of fore-exercise and about 200 minutes of test" is necessary to obtain an individual's true status in comparison with other individuals in a "standard test of intelligence" is supported by our results.<sup>6</sup>

As a measure of academic accomplishment the grades obtained by the students in all courses were averaged. The usual practice is to record these in literal form, the scheme in use at Goucher College being to assign 3 per cent. of the students in both required and elective courses to grade A, 22 per cent. to grade B, 50 per cent. to grade C, while to grades E and F respectively in elective courses 22 per cent. and 3 per cent., and in required courses 15 per cent. and 10 per cent. are assigned. In the Goucher Bulletin it is stated that these letters, A to F correspond with the work frequently described as excellent, good, average, poor, conditioned and failed. In the case of an F grade, the course in question must be repeated. An E grade indicates that certain work remains to be completed. If a student fails to remove a condition on a course by the time set, she is regarded as having failed in that course. In converting these literal measures into numerical terms it was decided to have one system of grading for both required and elective courses, to count all conditions that were later removed as D and all unremoved conditions as F. In this way were obtained for Senior and Freshman measures of their accomplishment in academic work. For the Seniors, the academic mark represents the composite result of approximately 30 separate grades and for the Freshmen 4-6 grades.

<sup>4</sup>ROGERS, AGNES L. *Experimental Tests of Mathematical Ability and Their Prognostic Value*. Teachers' College, Columbia University, N. Y. City, 1918. p. 45.

<sup>5</sup>ROGERS, AGNES L. *Experimental Tests of Mathematical Ability and Their Prognostic Value*. Teachers' College, Columbia University, 1918, p. 45.

<sup>6</sup>THORNDIKE, E. L. *Tests of Intelligence, Reliability, Significance, Susceptibility to Special Training and Adaptation to the General Nature of the Task*. School and Society IX, 216. February 15, 1919.



To determine the extent to which the test results are symptomatic of academic attainment, two methods were used. First, the degree of correspondence between the two sets of measures obtained from the tests and from averaging academic grades was calculated. Secondly, the extent to which students maintain their place in certain divisions of the group in the two sets was computed. Pearson coefficients of correlation are presented in Table II, which reveal the amount of interrelation between the tests and college marks.

TABLE II.

	Academic Seniors		Success Freshmen	
	r	P. E.	r	P. E.
Thorndike Test of Mental Alertness Series A,	.42	.056	.37	.043
Thorndike Test of Mental Alertness Series K,	.39	.058	.37	.043
Thorndike Test of Mental Alertness Series A and K, combined, .....	.43	.054	.40	.040
Rogers' Interpolation I, .....	.36	.059	.41	.040
Rogers' Interpolation Ia, .....	.31	.061	.29	.050
Rogers' Reasoning I, .....	.21	.065	.23	.048
Rogers' Reasoning Ia, .....	.20	.065	.12	.050

It is clear from these coefficients that the independence of the functions measured by the Mental Alertness and the Interpolation tests and by college marks is substantial. Between the Thorndike tests and academic grades the coefficient obtained is at least eight times the amount of the probable error and for the Interpolation tests it is not less than five times. As the shortness of the period of testing for the individual tests was believed to lower their reliability and this would tend to decrease the coefficients of correlation between tests and academic grades, various combinations of the tests were made after the manner suggested<sup>7</sup> by Woodworth<sup>7</sup> and the amount of correspondence between these composites and college marks was computed for the Seniors. These are presented in Table III.

TABLE III.

	Academic Seniors		Success Freshmen	
	r	P. E.	r	P. E.
Thorndike Test of Mental Alertness Series A and K combined,	.43	.05		
Thorndike Test of Mental Alertness A and Rogers Interpolation I combined, .....	.43	.05		
Thorndike Test of Mental Alertness K and Rogers' Interpolation Ia combined, .....	.90	.01		
Thorndike Test of Mental Alertness A and K and Rogers' Interpolation I and Ia combined, .....	.43	.05		

<sup>7</sup>WOODWORTH, R. S. *Combining the Results of Several Tests*. Psychological Review, XIX: 97.

With the exception of the composite obtained from the Mental Alertness Test K and Interpolation Test 1a these new composites yield coefficients but little larger than the Thorndike tests alone. Where the correlation obtained is so small, it would be unpermissible to use the method of the regression equation to predict even *on the average* future performance at college from achievement with the tests, much less the *individual's* probable status. The standard error made in using the regression equation to estimate academic success from mental performance, when Series A and K of the Thorndike Test are combined is in the case of the Seniors .45. The total range in academic grades for the Seniors is 2.13. This means that the probable error of our estimate is approximately one-fifth of the difference between the best and the poorest Senior. Since practical certainty is attained only between limits of 4 or 5 P. E., which in this instance covers the entire range almost, we cannot rely upon the tests as measuring instruments of individual promise of college students.

When we represent graphically the correlation between the Mental Alertness Test, Series A and K combined and College Marks as in Figures 1 and 2, this becomes very apparent. The wide variability in academic success corresponding to any particular degree of achievement in the tests is obvious.

The limitations of the tests as indicators of academic success are even more striking when we use the second method and consider the median, tertile, and quartile retention. The percentage of students retaining their place in the same halves of the distribution is shown in Tables IV and V, which indicate roughly the amount of displacement existing. Evidently we would have been wrong four times out of ten, if we had used the tests to predict academic success even so roughly as this classification implies.

TABLE IV  
Median Retention of Seniors.  
Academic Success.

Mental Alertness Test, A and K		
	1	2
1	29	20
2	18	31

Median Retention=60 or 61.2 per cent.

TABLE V  
Median Retention of Freshman.  
Academic Success.

Mental Alertness Test, A and K		
	1	2
1	56	34
2	35	57

Median Retention=113 or 62 per cent.

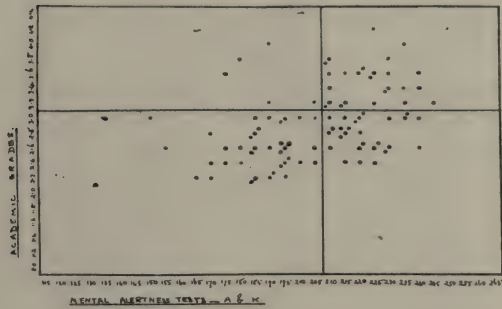


FIGURE 1

Scatter diagram showing the relation between the scores obtained by the Seniors in the Mental Alertness tests, Series A and K combined and their academic grades.

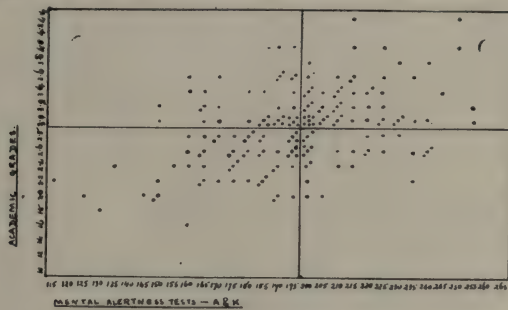


FIGURE 2

Scatter diagram showing the relation between the scores obtained by the Freshmen in the Mental Alertness tests, Series A and K combined and their academic grades.

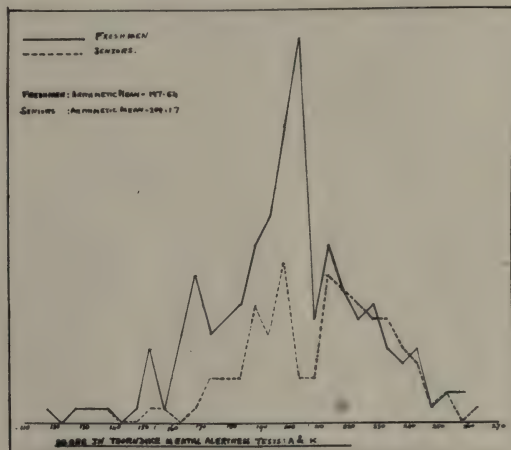


FIGURE 3



This result is emphasized by the more exact and detailed analysis of the same data obtained by calculating the actual number and percentage of students occupying the same quartile in both sets of measures. This is done in Tables VI and VII.

TABLE VI.

Quartile Retention of Seniors.  
Academic Success.

Mental Alertness Test, A and K		1	2	3	4
	1	12	7	3	3
	2	5	7	9	4
	3	4	7	5	7
	4	3	3	8	11

Quartile Retention=35 or 35.7 per cent.

TABLE VII.

Quartile Retention of Freshman.  
Academic Success.

Mental Alertness Test, A and K		1	2	3	4
	1	16	13	9	7
	2	13	14	12	7
	3	11	13	10	11
	4	5	6	11	24

Quartile Retention=64 or 35.1 per cent.

To predict an individual's probable status in academic work from his performance in the tests would obviously be rash. In this instance we would have erred in such a rough approximation to measurement as assigning a student to a definite quartile, sixty-five times in every hundred in the case of both Seniors and Freshmen. It is not even true that students in the highest quartile in college scholarship records never get into the lowest quartile in the test results nor that students in the lowest quartile in college records never get into the highest quartile in the test results.

A division of larger classes into three sections is not only more customary, but better justified on grounds of the distribution of mental capacities in the form of the normal frequency curve, in which there is observable a tendency to cluster around one type, small deviations from that central tendency being frequent and large deviations rare. The amount of tertile retention has therefore a special interest for us from a practical standpoint and is presented in Tables VIII and IX for Seniors and Freshmen respectively.

TABLE VIII  
Tertile Retention of Seniors.  
Academic Success.

Mental Alertness Test, A and K		1	2	3
	1	18	8	6
	2	10	12	11
	3	4	12	17

Tertile Retention=47 or 47.9 per cent.

TABLE IX.  
Tertile Retention of Freshman.  
Academic Success.

Mental Alertness Test, A and K		1	2	3
	1	34	13	13
	2	25	19	18
	3	13	17	30

Tertile Retention=83 or 45.6 per cent.

In this classification likewise we would be in error in 52 per cent. of the cases as far as the data derived from the Seniors are concerned and in 54 per cent. of the cases as shown by the results obtained from the Freshman. Speaking roughly we can state that every other assignment would have been an unwarranted assignment.

That these Mental Alertness tests requiring only an hour of time have some value, however, for purposes of classifying students in accordance with capacity as seen from a comparison of these results with those that are to be expected by mere random assignment of students to sections. By the latter method we have one chance out of two of assigning a student to the correct half of the group, one out of three of assigning her to the correct tertile and one out of four of assigning her to the correct quartile. The corresponding chances, where we make use of the Mental Alertness tests, Series A and K combined, employed in this investigation are approximately three out of five, two out of five and one out of two. To appraise adequately the practical value of the tests we would have, however, to compare their power to classify with that of the previous school record.

There are of course many reasons why perfect correspondence between ability as measured by the Mental Alertness tests and ability as measured by college grades should not be found. One obvious cause of the low correlation is that we are here dealing with a selected group, from which presumably those unfit to profit by college study have largely been eliminated. The Seniors have certainly

passed through a prolonged winnowing process. A comparison of the distributions for Seniors and Freshmen presented in Figure 3 gives evidence in support of this. It will be noted that the group average for Freshmen is less than that for Seniors and that the range towards the low end of the scale is greater for the former than the latter. Only 26.3 per cent. of the Freshmen reach or exceed the median for the Seniors. This may be partly due to chance errors of measurement, but it also indicates a constant cause at work, namely the elimination of the weaker students during the four years of the college course. The fact that both groups represent a selection of college candidates justifies the statement that the actual correspondence between success with the tests and academic promise is higher than the coefficients of correlation presented in Tables II and III indicate.

Furthermore it is obvious that the mental abilities underlying the two sets of measures—those derived from the tests and those based on academic records are not identical. The tests gauge predominantly innate intellectual dexterity, whereas college marks rather furnish measures of progress in learning, into which there enter to a very great extent emotional and moral elements. The conscious possession of purposes and the degree to which they dominate the mind are powerful factors in determining academic success. The extent to which the student identifies herself with the college class-work is as essential an element in the grades she receives as the intellectual acuity or skill she possesses. It has to be admitted that the mental tasks demanded by these tests are humble. Given sufficient time college women could master all of them readily. The emphasis is on speed rather than on difficulty and in so far as this is true they fall short of providing an ideal gauge of intellectual power. While well adapted to younger or less carefully selected individuals, they are, it would seem, too simple for use in classifying students on the basis of mental capacity. There is a general law that the harder the test, the greater is the scatter. The weak fall more conspicuously and the able succeed more markedly. To distinguish between the higher levels of intelligence we need therefore harder tests, involving more searching intellectual tasks.

Moreover, as has already been pointed out, the tests used in this investigation do not measure with sufficient accuracy the traits



they gauge. Their reliability coefficients show to what extent they fail in this respect. It is equally true that academic grades are imperfect, by no means determining exactly the abilities they purport to measure. It has to be borne in mind that college marks are not assigned to all students by the same instructors even in the same subjects of study and despite the standardization of grades secured by the use of a defined system, such as the Missouri system of grading, still misplacements are likely to occur. Students are graded by different instructors in different years and this tends to lower the accuracy of the ratings made and so far these compare unfavorably with the tests.

Certain capacities essential in academic work are undoubtedly measured by the tests and in spite of their defects they can be of service in two respects. In the first place they are superior, even if only slightly so, to haphazard guessing as a basis for allocating students to sections on grounds of mental capacity. Using Series A and K combined of the Mental Alertness test we have roughly one chance in two of making a proper assignment, whereas by haphazard selection we have but one chance in three. In the second place, they are of value in determining a lower limit, which when coupled with all the other information about an applicant to which the college has access, can reinforce a judgment as to fitness to undertake a college course. Thus it is practically certain that a student failing to attain a score of 125 in Series A and K combined lacks the ability that college work demands and should be discouraging from entering. Her efforts would be applied to better effect in other pursuits.

This investigation points to the directions in which the tests are susceptible of improvement. The period of testing must be lengthened. More capacities and more fundamental capacities should be measured. The student must be confronted with more subtle problems and more intricate tasks, so that intellectual power rather than speed is emphasized in the scores obtained. Smaller groups should be measured simultaneously so that the conditions of application are as normal as possible. Provided such improvements are made, the tests give promise of being a helpful supplementation of existing methods of selecting college entrants.

The need for a more satisfactory method of determining fitness to pursue a college course is great. Changes in College Entrance Ex-

aminations, notably by four of the colleges for women, have led to renewed interest in the problem. Columbia and other colleges for men have recently adopted psychological tests. It would seem incumbent that this new instrument should itself be carefully tested before it is accepted as the nonpareil and the satisfactory solution of a difficult situation.

Peter Sandiford

# Students' Methods of Studying a Certain Subject —Psychology

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## I. INTRODUCTION.

IN AN endeavor to discover students' methods of studying, one should bear in mind that it is erroneous to assume that a student in high school or college has general habits of studying, or that he applies the same methods of attack to each of the various subjects he happens to be carrying. It would be very valuable information if we knew which methods are best for general habits of studying and which are best suited to each of the different subjects. One procedure that might secure such knowledge would be to investigate the study habits of students in a number of subjects, and then to note those methods common to all of the subjects, as well as those peculiar to each. This would be a rather laborious task. Perhaps a better way would be to have groups of students use various methods of study in the different subjects, making sure that the technique provided for a control sufficient to measure adequately the results.

In the study here reported the problem was two-fold: 1st, to discover the habits of attack students were using in the course in Elementary Psychology, and second, to determine whether or not there was a difference in the methods of study employed by the good students and by the poor students; and, finally, whether the superior work of the good students was wholly dependent upon native ability, or in part upon superior methods of study.

During the fall semester of the academic year 1916-17 at Northwestern University there were six sections in Elementary Psychology with an enrollment of between 275 and 300 students. Two of the sections were conducted by the writer, the others were in charge of three instructors. The instructors were greatly interested in the problem and co-operated fully in gathering the data, for which I here acknowledge my indebtedness.

(193)



The following questionnaire was used in this investigation:

### QUESTIONNAIRE ON METHODS OF STUDYING

Name ..... Date .....

#### I. INSTRUCTIONS.

#### PLEASE READ AND FOLLOW INSTRUCTIONS CAREFULLY

1. Write your name and the date at the top of the page.
2. The purpose of this questionnaire is to discover your *habitual* methods of study. Answer every question with this idea in mind.
3. Answer each question, as far as possible, with "yes" or "no."
4. The answers will in no wise affect your standing in this or other courses.
5. Answer each question according to *facts* or this will be scientifically worthless.

#### II. QUESTIONS.

1. Do you in any way review the previous class work before beginning the study of the new assignment? ..... If so, is it by reading the assignment ....., by study of lecture notes ....., or by study of outline of the text.....?
2. On the average, how much time do you give to preparation for each class exercise in .....?
3. Do you usually read the assignment once, twice, or three times .....
4. Do you go over the assignment thoroughly and in detail the first time you read it? .....
5. Do you first read the assignment rapidly as a whole and then go over it later more slowly and get the details? .....
6. Do you outline the assignment in writing? .....
7. Do you pick out what you regard as the important features of the assignment mentally ....., or in writing? .....
8. Do you frame possible questions that might arise in the class room? .....
9. Do you take full, or brief organized class notes, ..... or no class notes? .....
10. Do you simply jot down notes in unorganized form what you regard as the most important features of the lecture? .....
11. Do you reorganize or work over your lecture notes outside of class? .....
12. Do you do all of your studying of one subject at one sitting? .....
13. Do you regularly follow a plan of distributing your time spent on one subject over more than one period? .....
14. After studying an assignment, do you usually try to think it out from memory before class time? .....
15. Do you have a specific time for the study of each subject? .....
16. Do you usually follow this plan? .....
17. Do you have a definite place ....., or places for study? ..... Or do you study at a variety of places depending upon conveniences of each day? .....
18. In preparing for tests or examinations, do you read the entire text over carefully .....; simply study outline of text .....; or lecture notes only .....? If you use more than one, which are they? ..... and to which of these do you pay more attention? .....
19. Is it your custom to prepare for an examination in one day or one night, ..... or do you extend the period over several days or nights? .....

The filling out of the questionnaire was supervised by the writer in each of the sections. The students were informed of the purpose of the investigation. I told them I wanted to know only the methods of studying they employed in dealing with Psychology, and they were asked to keep that in mind in answering each question. The necessity of carefully following the instructions were urgently impressed upon each class. The instructions were read aloud; then each question was repeated aloud and the students were requested to answer the question as soon as we had finished reading it.

In preliminary explanation, these points should be brought out. The questionnaire method is open to criticism, but at the present time I am unable to conceive of a method whereby we may discover students' methods of studying without asking them. The reliability of the answers may be questioned. Owing to the precautions we exercised, the students were fully aware that nothing was to be gained by misrepresentation; hence I am of the opinion that our results are as near the truth as one could expect. The form of the questionnaire may be criticised: there may be too many questions: perhaps one should confine the investigation to the daily preparation and omit the questions dealing with examinations. However, there may be variations well worth knowing. It is possible that we might have obtained better results had we studied the two problems separately. Many of the topics are weighted with subheads; more concise questions may be the better method. Probably the most severe criticism to be made has to do with our method of determining which are good and which are poor methods of studying. We arbitrarily assumed certain methods to be good, while others were classed as poor. Of course we took into consideration the experimental results upon learning, also the opinion of others such as is found in Whipple's "How to Study Effectively;" Kitson's "How to Use Your Mind," and others.

## II. RESULTS.

We tabulated\* the number of students answering each question. These figures range from 183 to 246. All the questions were answered by more than 200 students except in the case of one question, which had only 183 answers. The record of the number of

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\*I am indebted to one of my advanced students, Miss Ruth Neal, for much assistance in the tabulation.

students answering "yes," and the number answering "no" was kept separately for each question. We then figured the percentage that these latter numbers were of the total number answering each question. We have considered only the positive results in this paper.

*A. The Percentage of All Classes of Students Employing Various Methods of Studying.*

The statistical data for the above topic will be found in Tables 1 and 2. Table 1 gives the percentage of the entire group employing the good methods, while in Table 2 the percentages are stated with reference to the poor methods. It will be noted that we have divided each table into two groups for the purpose of indicating the methods employed in daily preparation and also those used in preparing for an examination. Thus, of the good methods, we have fifteen for daily preparation and three for examinations, while of the poor methods we have four and two in the respective divisions. We have numbered the methods in the order in which they were found in the questionnaire. The numbers in parenthesis after each method indicates its number in the questionnaire; thus Review (1) indicates that by referring to the questionnaire, the first question is found to request the student to state whether or not he reviews the preceding lesson before beginning the study of the new assignment.

TABLE I. PERCENTAGE OF THE WHOLE GROUP EMPLOYING GOOD METHODS.

DAILY PREPARATION.

1. Review (1), .....	.52
2. Hour Plus (2), .....	.59
3. Read Assignment Twice (3), .....	.40
4. Details Second Reading (5), .....	.33
5. Outline Assignment (6), .....	.27
6. Important Features Mentally (7), .....	.60
7. Important Features Writing (7), .....	.70
8. Raise Possible Questions (8), .....	.40
9. Brief Class Notes (9), .....	.55
10. Full Class Notes (9), .....	.43
11. Reorganize Lecture Notes (11), .....	.25
12. Distributed Effort (13), .....	.25
13. Recall Before Class (14), .....	.38
14. Regular Time (15), .....	.50
15. Regular Place (16), .....	.56

PREPARATION FOR EXAMINATION.

1. Lecture Notes and Text (17), .....	.91
2. Emphasize Lecture Notes (7), .....	.69
3. Distributed Effort (18), .....	.60



TABLE 2. PERCENTAGE OF THE WHOLE GROUP EMPLOYING POOR METHODS.

DAILY PREPARATION.	
1. Read Assignment Once (3), .....	.58
2. Details First Reading (4), .....	.70
3. Unorganized Class Notes (10), .....	.25
4. Massed Effort (12), .....	.70
PREPARATION FOR EXAMINATION.	
1. Emphasize Text (17), .....	.31
2. Massed Effort (18), .....	.40

### 1. *Good Methods.*

*Daily Preparation.* An examination of Table 1 reveals the fact that of the fifteen good methods here listed, only seven are employed by more than fifty per cent. of the students. Of these seven, six are employed by from fifty and sixty per cent., and one by seventy per cent. The latter is the picking out of the important features in writing. Under this question the students were allowed to answer "yes" if they underscored the text. This seems to be a prevalent habit. However, we must recognize that this practice can easily become of no value by the underscoring of too much of the text. On the other hand, eight of the good methods are practiced by less than fifty per cent. of the students. Of these eight methods three are used by from forty to fifty per cent., two from thirty to forty, and three below thirty per cent. Two of the fifteen methods, recall and distributed effort, have been proved superior by experimental results. These are used by only thirty-eight and twenty-five per cent. of the students, respectively.

*Preparation for Examination.* All three of the methods mentioned in this division have a score of sixty or above, one attaining a score as high as ninety-one. No other usage is so prevalent among all the students.

*Conclusion.* We are forced to conclude upon the basis of the above analysis that the majority of the good methods for daily use are not found to be among the study habits of the majority of the students. Better habits of study are employed by the larger number of students in preparing for an examination than is the case in preparing for the daily class exercise.

## 2. *Poor Methods*

*Daily Preparation.* In Table 2 there are listed four methods under this caption. Of these four methods one has the score of fifty-eight and two reach the high mark of seventy, while one goes as low as twenty-five. It will be noticed that massed effort, the one method experimentally proved to be poor, is practiced by seventy per cent. of the students.

*Preparation for Examination.* Of the two methods here presented, each is employed by forty per cent., or fewer, of the students. One outstanding feature is the decrease in the number of students who use massed effort in preparing for their daily work, as compared with those who employ the same method when preparing for examinations.

*Conclusion.* It is quite evident that the conclusion to be reached from a study of these data is that the larger number of poor methods is in daily use by a majority of the students. In the case of examinations the reverse is true.

## 3. *General Tendency of the Group*

From a study of the data in Tables 1 and 2 when they are combined, it appears that the general tendency of the group is not to practice good habits of study, since the weight of the evidence is in the opposite direction. Forty per cent. of the students do not put into practice eighty-three per cent. of the good methods, fifty per cent. of them do not habitually employ fifty per cent. of these methods, while sixty to seventy-five per cent. confess that they do not employ thirty-nine per cent. of the good methods. On the other hand, from forty to seventy per cent. of the students confess that they use sixty-six and two-thirds per cent. of the poor methods. Considering the evidence, we believe that we are justified in concluding that the majority of the students lack good habits of studying Elementary Psychology.

### B. *A Comparison of the Study Habits of Good and Poor Students.*

The second problem growing out of this investigation is to discover, if possible, whether the good students have better habits of

study than the poor students. The good and the poor students were determined by the grade received in the course in Elementary Psychology. The grades at Northwestern are: A, B, C, D, E and F. All the students receiving the grade of A were classed as good students; these we have entitled the A group. Students obtaining the grade of D or lower were said to be poor students and these we have called the D group. The A group has in it 39 students and the D group is made up of 33 students. Both men and women are in each of the groups. We have figured the percentage of students in each group that answered "yes" to the various questions. These figures are given in Tables 3 and 4. Table 3 gives the percentages of the two groups employing good methods, while in Table 4 will be found the percentage of students in the A and D groups practicing poor methods of studying. The numbers in parenthesis are for the same purpose as indicated in Tables 1 and 2. We have again divided the data according to daily work and preparation for examination.

### 1. *Good Methods.*

*Daily Preparation.* A study of the data in Table 3 reveals the fact that in ten of the fifteen methods under daily preparation the A group has a larger score; a larger percentage of the D group uses four of the methods and in one instance the two groups are tied. A better comparison is obtained if we consider the differences in the scores of the two groups. The differences in favor of the A group range from 2 to 24; eight of the differences are above 11; the average is 12.5 and the median is 13.5. The range of the differences in favor of the D group is from 2 to 6; the median is 4.5 and the average is 4.25.

*Preparation for Examination.* There are only three methods under this heading. A large percentage of the D group uses two of the methods leaving only one in favor of the A group. This one which has a greater number of A's has a difference in its favor of 23; the other two have differences of 1 and 16.

*Conclusion.* In doing their work from day to day, the A students have presented the preponderance of evidence to prove that they employ the better methods of study. The evidence as concerns examinations is more evenly divided, the two groups have practically the same score for one method; as concerns the other two methods



TABLE 3. PERCENTAGE OF STUDENTS IN THE A. AND D GROUPS EMPLOYING GOOD METHODS.

DAILY PREPARATION.		
	A	D
1. Review (1), .....	.51	.56
2. Hour Plus (2), .....	.76	.64
3. Read Assignment Twice (3), .....	.42	.42
4. Details Second Reading (5), .....	.35	.31
5. Outline Assignment (6), .....	.23	.29
6. Important Features Mentally (7), ....	.69	.55
7. Important Features Writing (7), ....	.64	.51
8. Raise Possible Questions (8), .....	.50	.26
9. Brief Class Notes (9), .....	.56	.58
10. Full Class Notes (9), .....	.44	.42
11. Reorganize Lecture Notes (11), .....	.11	.00
12. Distributed Effort (13), .....	.29	.16
13. Recall Before Class (14), .....	.37	.41
14. Regular Time (15), .....	.66	.45
15. Regular Place (16), .....	.72	.61
PREPARATION FOR EXAMINATION.		
1. Lecture Notes and Text (17), .....	.90	.91
2. Emphasize Lecture Notes (17), .....	.79	.56
3. Distributed Effort (18), .....	.48	.64

TABLE 4. PERCENTAGE OF STUDENTS IN THE A AND D GROUPS EMPLOYING POOR METHODS.

DAILY PREPARATION.		
	A	D
1. Read Assignment Once (3), .....	.52	.58
2. Details First Reading (4), .....	.73	.69
3. Unorganized Class Notes (10), .....	.22	.45
4. Massed Effort (12), .....	.62	.76
PREPARATION FOR EXAMINATION.		
1. Emphasize Text (17), .....	.21	.44
2. Massed Effort (18), .....	.52	.36

each group has one in its favor, but the larger difference is on the side of the A's. However, the relative value of the two methods is of vital importance, as it is throughout the entire comparison, and of this fact we have no positive proof. Hence, we conclude that the A students are much more in the habit of putting into practice in their daily work the good methods. As concerns examinations, the evidence does not justify a positive conclusion.

## 2. *Poor Methods.*

*Daily Preparation.* The scores for three of the four methods listed under this topic indicate that they are practiced by a larger percentage of the D group. In the one method having a larger

per cent. of the A's the difference is only 4, while with those practiced by more of the D's, the range is from 6 to 14 and the average is 14.3.

*Preparation for Examination.* As in the instance of the good methods, the two groups are more evenly divided. Of the two methods employed for this purpose each group has the higher percentage in one instance. In the matter of the difference, the score of the A's is 16, while that of the D group is 23.

*Conclusion.* Our data justify the conclusion that the poor methods of study are more widely used by the D students. This is certainly true in regard to daily work; the majority of the methods are daily employed by the larger percentage of the D's. For examination the evidence is only slightly in favor of the A students.

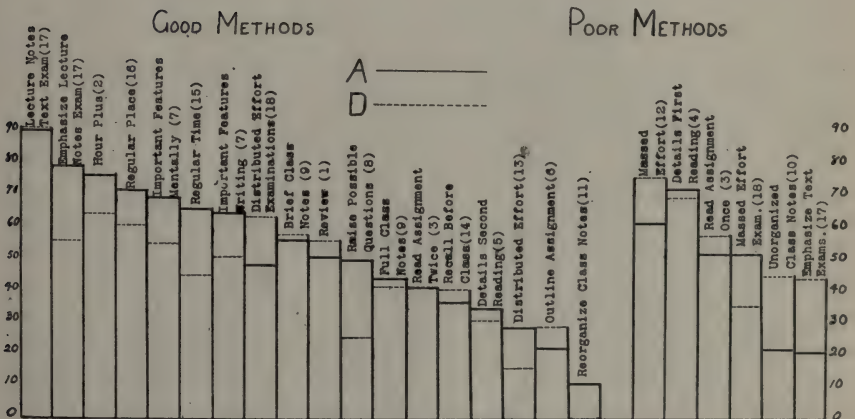
### 3. A More General Comparison of the Two Groups.

For the purposes of this comparison we have combined the data of Tables 3 and 4. All of the good methods have been placed in one group, likewise all of the poor methods.

#### Good Methods

Of the eighteen good methods eleven are more frequently employed by the A students; a larger percentage of the D group use six of the methods, and both groups have the same percentage in one

#### Comparison of A and D Groups.



instance. By computing the differences of the scores for the two groups, we discover that these range from 2 to 24 in the case of the A group; all but two of them are above 11. The average is 13.45 and the median is 13. Of the six cases wherein the D students excel, the differences range from 1 to 16, five of them are not above 6, while the average is 5.66 and the median is 4.50.

### *Poor Methods.*

We have under this heading six methods, four of which are more generally employed by the D group, leaving only two wherein the A's excel. The differences are again significant. Those in favor of the poor students range from 6 to 23, with an average of 16.5; the two differences for the A students are 4 and 16, giving an average of 10.

### *Conclusions.*

The methods we have designated as good are more widely used by the A students. In other words the larger percentage of the better students regularly use a greater number of the good methods than do the D students. The reverse is true in the case of the poor methods; the majority of the methods are favored by the D group while the differences in the percentages of the two groups using these methods are greater on the side of the poorer students. Hence we conclude that the A students have better methods of studying than do the poorer or D students.

There is a positive correlation between the two groups. The methods were ranked according to the percentage of students in each group practicing them; thus the one having the highest percentage was ranked first, and the others in order. The rank-difference formula was used.\* The computation yielded an index of correlation of .81 for the good methods and .70 for the poor methods. This simply means that there is a rather strong tendency for the same methods to be favored by the two groups; i. e., if a method is popular with the good students it is likely to be frequently used by the poor students. In other words, that method employed by a large percentage of one group is likely to fare similarly with the other group. This matter of correlation in no way invalidates



the preceding conclusion. The differences in the percentage scores of the two groups are the more significant data.

### III. SUMMARY OF CONCLUSIONS AND DISCUSSION.

Upon the basis of the foregoing study we have been able to make the following conclusions:

#### 1. *Concerning the entire group of students.*

Our results have shown that in preparing for the daily class work the majority of the good methods of study are not regularly employed by the larger number of students; on the other hand the greater percentage of the poor study methods is practiced by a majority of the students.

Somewhat better conditions were found as concerns the habits of the students in preparing for examinations. The majority of the good study habits was generally practiced by the larger group of the students, while the minority of the students confessed to using poor methods of study. The students on the whole seem to be wiser in regard to examinations than they are in their daily work.

When we considered both the good and the poor study methods in one group, we were forced to conclude that the general tendency of the majority of the students is to practice poor methods of work in their study.

#### 2. *Concerning the good and the poor students.*

The A students gave evidence that they were much more in the habit of employing in their daily work, the larger percentage of the good methods of study; the minority of this group were found to be daily practicing the poor study methods. The reverse condition existed with the D students. Hence, we concluded that the good students possess better daily study habits than do the poor students.

The contrast was not so striking in regard to preparation for an examination. However, the evidence was slightly in favor of the A students in this instance, thus forcing the conclusion that the better students tend to have the better study habits in preparing for an examination.

By grouping the evidence under one heading, the case in favor of the good students is strengthened. The preponderance of the evidence was in favor of the good students. The conclusion is that there exists on the whole, a very strong tendency for the better students to practice good habits of study, while the poorer students generally lacked these good habits, and were rather inclined to favor the usage of poor methods.

### 3. *Concerning the matter of correlation.*

A rather high positive correlation was shown to exist between the methods, both good and poor, employed by the A and the D students. This simply means that that method, whether good or poor, that was used by one group was likely to be in favor with the other group. This in no way invalidates the conclusions we have made in comparing the two groups of students. The difference in the percentage of each group employing the various methods is the significant evidence to be considered, and the correlation here referred to does not affect this point.

There are one or two practical applications of the above results that need to be considered. This investigation indicates clearly that the study habits of the majority of students are merely picked up. It has been largely a matter of chance as to which methods have been employed. While our questionnaire did not have a question that would indicate the source of the study habits of the students, I am assuming that since the lack of generally good methods was so prevalent that the students, had they known the difference, would have been wise enough to choose the better ones. This argues strongly for more general instruction in how to study. It must be remembered that these students came from a large number of high schools scattered over a wide territory. This would indicate that it is not generally the custom of high schools to instruct their students in the best methods of attacking the problems arising out of the effort to master the various subjects of the curriculum. It will be recalled that the students from whom these data were gathered were sophomores, juniors and seniors in college. If these students, thus far advanced, have done such a poor job of building up study habits, what should we expect in the high school? Conditions equally as bad or worse would probably be found, for the

younger the student the less mature the experience and judgment, and hence the smaller his ability to criticise and remedy his own methods of work. No doubt many of the work habits of students are built up rather early in life. I do not believe that the problem begins with the high school. Should it not be a part of the task of every teacher, especially in the elementary grades, to know something of the methods of study the pupils are employing? Were this important task begun rather early and then as soon as the proper time arrives, some formal instruction given in how to study, I believe that we could expect much better results from a large part of our teaching.

The colleges are as neglectful of the study problem as are any of the other educational institutions. Few of the higher institutions of learning have a course for their freshmen in how to study. I have become convinced that the students want to know what are the best methods of approach to their work. In one of my courses I require a review and criticism of certain books. I have listed among these works several dealing with habits of study. These are growing in popularity with the students. The statement I most often encounter is, "I should have read this book in my Freshman year." Some of the comments are rather pathetic. I quote one. "I have never read a book on the nature of how to use your mind before, much to my regret; and I fully realize the loss of these important facts in my Freshman year at college. The maxim 'Don't be a dead one' has haunted me since first I opened the book, for I know that opportunities pointing towards a Phi Beta Kappa key have passed quietly by me, unrecognized and unattempted. After I had completed the book I felt a great deal like—a hopeless sinner, who now determines to strike for the right path—and in my Junior year! However, I do not intend to assume the entire blame for this situation, since I was never taught how to study. I simply went at it in a haphazard way—due to the lack of proper supervision." Here is a student, who, I believe, could have raised her general scholastic standing had she been properly guided. No doubt a good student gets his lessons in spite of poor methods, but why should the good students be burdened with inefficient tools and why should the poor students be hindered by the lack of efficient methods of working? I believe that it is highly probable that many



of the B and C students could become A- or A in their scholarship, while many of the D students could lift themselves out of the mire of poor scholarship. Do not our educational institutions owe such an effort to the students? If we are to apply our psychology and attack the educational problem from the student's point of view, certainly the study problem offers a most excellent opportunity for such application.

# An Educational Survey Test

RUDOLF PINTNER AND FLORENCE FITZGERALD

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GROUP tests of mental ability have now definitely found their place in the field of mental measurement. The mental survey is well established. It is the belief of the writers that we also need group tests for educational surveys to determine roughly general educational attainment just as the mental tests determine general mental ability.

We, therefore, need some kind of educational scale by means of which we can sum up a child's educational attainment in a single value, comparable with the value obtained by our mental tests. In order to do this we must have a selection of short educational tests which cover the main subjects that the school teaches. It is obvious that if we attempt to do this we shall have to base our result upon a careful selection of a few items out of the several standard school subjects, particularly if our test is to be of such a nature as to be given at one sitting.

More specifically the problem is to devise a short educational test covering the main subjects of instruction that can be given in about thirty or forty minutes. This test should include all the important subjects that are ordinarily taught in the elementary school. Recognizing, of course, that five to eight minutes' work on each subject cannot give us an accurate measure of an individual's attainment in each subject, such as we might obtain by devoting thirty to fifty minutes to each subject, there is, nevertheless, great practical need of a short scale covering the chief subjects that will give a fair measure of the general attainment of the individual and a good measure of the group. By means of this we can obtain accurate measures of different grades, of different schools and of different school systems.

The exercises in our Educational Survey Test were selected from the Standard Educational Tests and Measurements. The following criteria for selecting the examples were kept in mind and given consideration where they did not interfere with the value of the test. Except in comprehension tests in reading, those tests which

were expressed in the most easily and readily understood language were given preference. Those tests, which, according to the judgments of those selecting them and their experience with them, seemed to be most commonly successful and least subject to unfavorable external factors, were selected. Exercises were selected at approximately equal intervals along the range of the Standard Scales, so that the short test represented a graduation of difficulty comparable to that of the long scale. And, other things being equal, the tests which required a minimum of time and space in answering and consequently a minimum of time in grading, were chosen.

### THE TESTS.

#### I. *Vocabulary.* (Thorndike).

Look at the words below and write

The letter F under every word that means a Flower;

The letter N under every word that means a Boy's Name;

The letter B under every word that means a Book;

The letter G under every word that means good to be or do.

samuel, kind, lily, pansy, generous, modest, claude, courteous, merciful, reasonable, isaiah, chrysanthemum, considerate, reuben, ezra, ichabod, ledger, crocus, dahlia, jonquil, begonia, equitable.

#### 2. ARITHMETIC. (Woody-Stone).

$$3 \times 7 =$$

Add

$$\begin{array}{r} 2 \\ 4 \\ 3 \\ \hline \end{array}$$

Subtract

$$\begin{array}{r} 13 \\ 8 \\ \hline \end{array}$$

Multiply

$$\begin{array}{r} 310 \\ 4 \\ \hline \end{array}$$

$$1)1$$

Subtract

$$\begin{array}{r} 50 \\ 25 \\ \hline \end{array}$$

Add

$$\begin{array}{r} 43 \\ 1 \\ 2 \\ 13 \\ \hline \end{array}$$

$$\frac{1}{4} \text{ of } 128 =$$

Subtract

$$\begin{array}{r} 567482 \\ 106493 \\ \hline \end{array}$$

Add

$$\begin{array}{r} 199 \\ 194 \\ 295 \\ 156 \\ \hline \end{array}$$

$$\frac{7}{8} \times \frac{3}{4} =$$

$$.003) .0936$$

If you buy 2 pencils for 7 cents each and a book for 65 cents. How much change should you receive from a two dollar bill?



Two girls receive \$2.10 for making buttonholes. One makes 42 and the other 28. How shall they divide the money? 1

$$1/3 + 1/3 =$$

$$7.3 - 3.00081 =$$

$$9)69 \text{ lbs. } 9 \text{ oz.}$$

$$25.09 + 100.4 + 25 + 98.28 + 19.3614 =$$

### 3. READING. (Kelly).

Answer these questions:

#### No. 1

The air near the ceiling of a room is warm, while that on the floor is cold. Two boys are in the room, James on the floor and Harry on a box eight feet high. Which boy has the warmer place?.....

#### No. 2

Think of the thickness of the peelings of apples and oranges. Put a line around the name of the fruit having the thinner peeling.  
apples oranges

#### No. 3

If you would rather have a dollar than a little stone, do not put a line under dollar, but if you would rather have five dollars than a pencil, put a line under stone.

dollar stone

#### No. 4

Here are some names of things. Put a line around the name of the one which is most nearly round in every way like a ball.

saucer teacup orange pear arm

#### No. 5

I have five plums and Mary has four plums. Jane comes along and we see that she hasn't any. We want to divide with Jane in such a way that we shall all three have the same number. I gave Jane two plums. How many must Mary give her? .....

#### No. 6

Read these carefully:

Bears are larger than bugs.

Houses are larger than bears.

Mountains are larger than houses.

Then bugs are not as large as mountains.

I have tried to make no false statement among these four. If I have succeeded, underline the word success. If I have failed underline the word failure.

success failure

#### No. 7

It was a quiet, snowy day. The train was late. The ladies' waiting room was dark, smoky and close, and the dozen women, old and young, who sat waiting impatiently, all looked cross, low spirited or stupid.

In this scene, the women probably kept their wraps on, because they wished to be ready to take the train. Pretty soon the station agent came and put more coal in the stove, which was already red-hot in spots. Do you think this made the women happier? .....

"Magnanimity in politics is not seldom the truest wisdom; and a great empire and little minds go together." (Burke)

Study Burke's quotation carefully. If he was in favor of territorial expansion as the goal of English politicians he was a standpatter. If he believed in the establishment of justice in human relations even at the sacrifice of territorial expansion, he was a progressive. Which was he, a standpatter or a progressive?  
.....

4. READING. (Thorndike).

Read this and then write the answers. Read it again as often as you need to. John had two brothers who were both tall. Their names were Will and Fred. John's sister, who was short, was named Mary. John liked Fred better than either of the others. All of these children except Will had red hair. He had brown hair.

- 1. Was John's sister tall or short?.....
- 2. How many brothers had John?.....
- 3. What was his sister's name?.....

Read this and then write the answers. Read it again as often as you need to. Long after the sun had set, Tom was still waiting for Jim and Dick to come. "If they do not come before nine o'clock," he said to himself, "I will go on to Boston alone." At half-past eight they came bringing two other boys with them. Tom was very glad to see them and gave each of them one of the apples he had kept. They ate these and he ate one too. Then all went on down the road.

- 1. When did Jim and Dick come?.....
- 2. What did they do after eating the apples?.....
- 3. Who else came beside Jim and Dick?.....
- 4. How long did Tom say he would wait for them?.....
- 5. What happened after the boys ate the apples?.....

Read this and then write the answers. Read it again as often as you need to. It may seem at first thought that every boy and girl who goes to school ought to do all the work that the teacher wishes done. But sometimes other duties prevent even the best boy or girl from doing so. If a boy's or girl's father died and he had to work afternoons and evenings to earn money to help his mother, such might be the case. A good girl might let her lessons go undone in order to help her mother by taking care of the baby.

- 1. What is it that might seem at first thought to be true, but really is false?.....
- 2. What might be the effect of his father's death upon the way a boy spent his time?.....
- 3. Who is mentioned in the paragraph as the person who desires to have all lessons completely done?.....

5. COMPLETION. (Trabue).

Make good sentences. Write only *one* word on each blank.

- 1. We are going ..... school.
- 2. The sky ..... blue.
- 3. The ..... plays ..... her dolls all day.
- 4. Boys and ..... soon become ..... and women.
- 5. The poor baby ..... as if it were ..... sick.
- 6. She ..... if she will.
- 7. The poor little ..... has ..... nothing to .....; he is hungry.
- 8. A home is ..... merely a place ..... one ..... live comfortably.

9. To ..... many things ..... ever finishing any of them .....  
a ..... habit.
10. The knowledge of ..... use fire is ..... of  
..... important things known by ..... but unknown .....  
animals.
11. One ought to ..... great care to ..... the right .....  
of ..... for one who ..... bad habits ..... it  
..... to get away from them.

6. PUNCTUATION—GRAMMAR. (Starch).

Punctuate correctly:

1. We visited New York the largest city in America.
2. I like to work he said especially in the morning.

Cross out what is wrong, and leave the words so as to make a good sentence.

1. The paper reported (he; him) to be dead.
2. I can do it as well as (they; them).
3. The difference between summer and winter (is that; is) summer is warm  
and winter is cold.
4. I shall always remember the town because of (the good times I had; the  
good time) and the many friends I made there.
5. (Who; whom) do you mean?
6. A different set of knives and forks (was; were) put on the table.
7. (He sprang; springing) to the platform on which the dead man lay (and  
shouted; he shouted).

7. GEOGRAPHY. (Hahn-Lackey).

Answer these questions:

1. In what direction are you facing when your back is toward the north?  
.....
2. Name two other countries in North America besides the United States.  
.....
3. Name two large bodies of water that border on Florida. ....
4. What is the cause of day and night?.....
5. Name a mountain range and a river between Europe and Asia.....
6. Give two reasons why cities usually grow up at falls in rivers.....
7. What and where are the following:  
Nova Scotia .....  
Calcutta .....  
Good Hope .....  
St. Elias .....  
Moscow .....
8. Give one reason why Chicago rather than St. Louis has become the railroad  
center of the middle west.....
9. Why does the southeast coast of Brazil get a comparatively heavy rainfall?  
.....
10. Why does the temperature often rise when snow begins to fall? .....

8. HISTORY. (Van Wagenen).

Answer these questions:

1. In what did the American Indian live?
2. Who was first President of the United States?
3. Name any American general.
4. Who was President of the United States during the Civil War?
5. Name any one of the battles of the Revolutionary War.
6. Name two purchases of land that have been made by the United States.



7. What were the first four nations to make settlements in America?
8. What public improvement was under construction during each of the following periods:
  - 1806-1814 .....
  - 1817-1825 .....
  - 1904-1914 .....
9.
  - a. Who invented the telegraph?.....
  - b. Who invented the telephone?.....
  - c. Who laid the first successful Atlantic cable?.....
  - d. Who wrote the Declaration of Independence?.....
  - e. Who was Secretary of War during the greater part of the Civil War?....
10. In front of each of these questions below write the name of the President during whose administration the events took place.
  - ..... War with Mexico?
  - ..... Spanish American War?
  - ..... Purchase of Florida?
  - ..... Assertion of the Monroe Doctrine in the Venezuelan dispute?
  - ..... Beginning of construction of Panama Canal?

The twenty-two words for measuring the vocabulary element in reading were selected from Scale A of Thorndike's Visual Vocabulary Scales,<sup>1</sup> at fairly equal intervals of difficulty from the least difficult to the most difficult. Two of the eighteen exercises in arithmetic were selected from the Stone Reasoning Tests. The remaining problems were taken from Woody's Arithmetic Scale<sup>2</sup>; five in addition, four in subtraction, four in multiplication, and three in division. They are arranged from the least to the most difficult, and represent, roughly, equal steps of difficulty as determined by Woody. Comprehension of meaning in reading is measured by two sets of exercises; the one taken from Kelly's Silent Reading Tests<sup>3</sup> and the other from the Thorndike Scale Alpha.<sup>4</sup> There are eight exercises in the former, and three exercises in the latter. The sentences for measuring language ability are from Trabue's Completion Test Language Scales.<sup>5</sup> The usage of Grammar is measured by two sentences from Starch's Punctuation Scale, and by seven sentences from his Grammatical Scale A.<sup>6</sup> The ten questions in

<sup>1</sup>THORNDIKE, E. L. *The Measurement of Achievement in Reading; Word Knowledge*. Teachers' College Record. November, 1916.

<sup>2</sup>WOODY, C. *Measurements of Some Achievements in Arithmetic*. Teachers' College Contributions to Education. No. 80, 1916.

<sup>3</sup>KELLY, F. J. *The Kansas Silent Reading Tests*. Journal of Educational Psychology. Vol. VII. February, 1916. pp. 63-80.

<sup>4</sup>THORNDIKE, E. L. *An Improved Scale for Measuring Ability in Reading*. Teachers' College Record, November, 1915, and January, 1916.

<sup>5</sup>TRABUE, M. R. *Completion Test Language Scales*. Teachers' College Contributions to Education. No. 77, 1916.

<sup>6</sup>STARCH, D. *Educational Measurements*. Macmillan.

Geography show a fair sampling of the degrees of difficulty in the Hahn-Lackey Composite Scale<sup>7</sup>. The ten questions in History are from the Van Wagenen American History Scales, Information A and B. They represent an increasing range of difficulty.

These eight sets of exercises have been printed in booklet form with a view of economy of space and of convenience in giving, taking and scoring the tests. Half of page 1 contains blanks for the name, age, grade, and school of the pupil. On the other half the vocabulary test is so printed that the pupil must turn the page around in order to read the test. Pages 2, 3 and 4 follow page 1 as the right hand pages, always, of the booklet. Page five is the back of page 4 but printed in the reverse direction so that the pupil must turn the booklet around. With the booklet in this new position, pages 6, 7 and 8 follow as the right hand pages. Since the time element is very important in giving these tests, this arrangement makes the page opposite that one on which the pupil is working always reversed and thus prevents him from reading it. This saves his attention for the test on which he is working, and keeps him from becoming acquainted with another test outside the time allotted to it.

Since it was desirable to have the time limits for the tests short enough to prevent even the very brightest pupils from completing everything, the preliminary test sheets were given to a group of grade children and also to a group of college students, and records of the time required for each student for each test were kept. With these results as guides, one and one-half minutes were given for the Vocabulary test, five minutes for Arithmetic, two and one-half minutes for the "Kelly" reading, three and one-half minutes for the "Thorndike" reading, four minutes for language, one minute for Grammar, four minutes for Geography, and four minutes for History. This gives a total of twenty-five and one-half minutes. Allowing time for directing the pupils from one test to another, for writing their names, ages, grades, and schools on page 1, and for passing and collecting the papers, thirty minutes is sufficient for giving the entire set of tests to most of the grades, and perhaps thirty-five minutes for grades two and three.

It was one of the aims in constructing this series of tests to

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<sup>7</sup>LACKEY, E. E. *A Scale for Measuring the Ability of Children in Geography*. Journal of Educational Psychology. Vol. IX. October, 1918.

reduce instructions to a minimum. No special instructions are necessary. The children are merely told to do what it tells them to do. The understanding of the very simple instructions printed at the beginning of each test may be assumed a prerequisite for the knowledge called for by the test.

In deciding the score values, the relative importance of the different subjects included in the tests was taken into consideration. About equal weight was given to Reading and to Arithmetic. History and Geography were weighted a little less and Grammar and Language combined again a little less. The difference in weight given to these subjects is, however, slight. The following table shows the method of scoring which was adopted:

Tests	No. of Elements	Points for Each	Highest Possible Score
Vocabulary, .....	22	$\frac{1}{2}$	11
Arithmetic, .....	18	2	36
Reading K, .....	8	2	16
Reading T, .....	11	1	11
Language, .....	11	1	11
Grammar, .....	9	1	9
Geography, .....	23	1	23
History, .....	24	1	24

By combining the three reading tests, and also the language and grammar tests, the highest possible scores rank the subjects in this order:

<i>Subject.</i>	<i>Highest Possible Score.</i>
Reading .....	38
Arithmetic .....	36
History .....	24
Geography .....	23
Grammar and Language .....	20
Total .....	141

By means of stencils and keys the test papers can be scored very rapidly.

After this much of the Test Construction had been completed a preliminary standardization of the work was attempted. The tests were given to 1,360 individuals in grades 2 to 8 inclusive, in high



school and in college. The results were scored and percentiles were calculated for the various ages and grades. The median percentile scores by ages and by grades are given in Tables I and II respectively.

TABLE I.

Age, .....	6	7	8	9	10	11	12	13	14	15	16	17	Adult
Med. Score, ....	2	2	12	20	32	38	41	49	48	55	72	80	109
No Cases, ....	6	143	154	177	208	196	162	124	84	49	18	11	28
Total,													1360

TABLE II.

Grade, ..	2	3	4	5	6	7	8	9	10	11	12	
Median Score. ..	3	13	25	36	47	61	67	77	76	75	83	
No. Cases, ..	233	212	234	250	206	83	73	16	19	12	5	Total 1333

#### A COMPARISON OF THE ABBREVIATED AND STANDARD FORMS

The next step consisted in establishing the reliability of the Abbreviated form by comparing the results obtained from it with the results obtained from the Standard Educational Measurements from which its tests were taken. In this process the long tests were given to as many pupils as possible who had taken the short forms. The children tested were from five different schools; a rather low grade city elementary school including all eight grades but in which only children from the sixth, seventh and eighth grades, took both tests; a grade school in a foreign district, but in which, however, the children were of about average mentality; a large grade school of medium standard including only the first six grades; the seventh and eighth grades in a village school; and the pupils in a rural high school. Grades 3, 4, 5, 6, 7, and 8 and the four years of high school were represented in the numbers who took the two forms of tests; altogether about 450 children, 247 taking both tests in vocabulary, 200 taking both in Arithmetic, 258 in Reading K, 270 in Reading T, 255 in Language, 208 in Grammar, 113 in Geography and 125 in History. The exact number, by classes and schools, tak-

ing each test can be seen by referring to Table III showing the coefficients of correlation.

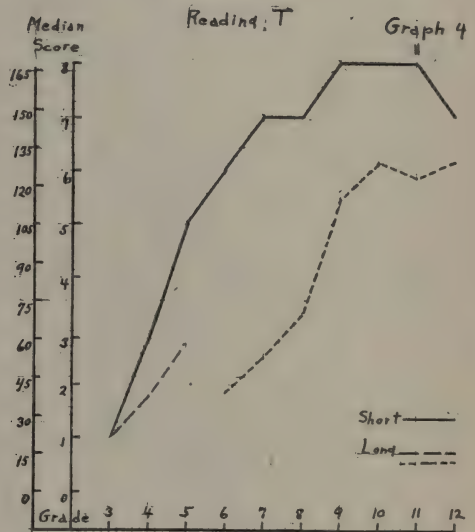
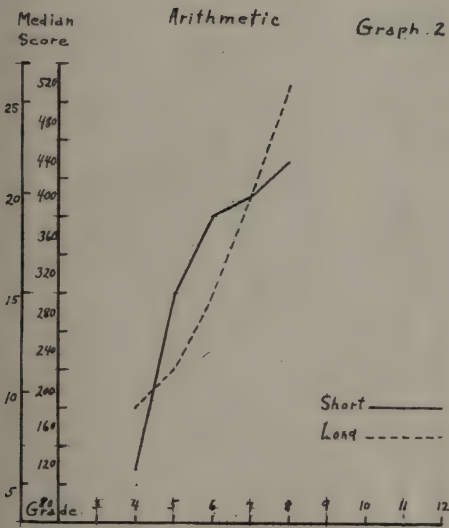
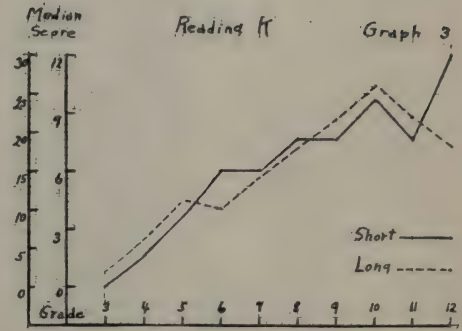
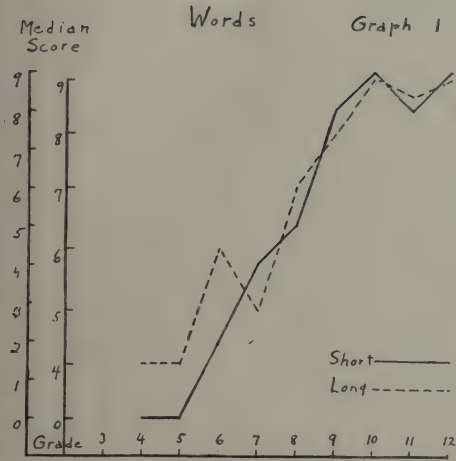
The distribution tables for the short and long forms are too lengthy to be printed here. A study of them shows on the whole that the short form distributes the cases fairly well. We must be content here with a study of the median scores for each grade. Graphs 1 to 8 show the rise of median scores from grade to grade on both the short and long forms of each test. The continuous line, in each case represents the short form, and the broken line, the long form. The more closely the two curves tend to take the same form and direction, regardless of the distance between the two lines the greater is the correlation between the short and long forms of the tests, as far as such correlation can be estimated from the central tendencies of groups.

In most cases the curves agree fairly closely, this being particularly noticeable in Arithmetic, Reading K, Reading T and Trabue. We have hardly adequate data for this kind of a comparison on Geography. With History we have a close approximation except for the large divergence at Grade 11, which can be adequately accounted for by the very few cases tested.

In all cases the greatest irregularities occur in grades nine, ten, eleven and twelve, that is, in the high school. This might be explained by either one of two factors. Such a small number of pupils was tested in each of these grades that the sampling is insufficient, or the fact that these pupils were tested in subjects with which they were all about equally unfamiliar and consequently a gradual increase in scores in these grades could not be expected. Grade 11 is consistently lower in practically all the tests and on both scales, which fact would seem to denote a general inferiority of that grade rather than a poor correlation of the one test with the other. Fair measures of high school pupils will have to be obtained by a test containing high school subjects.

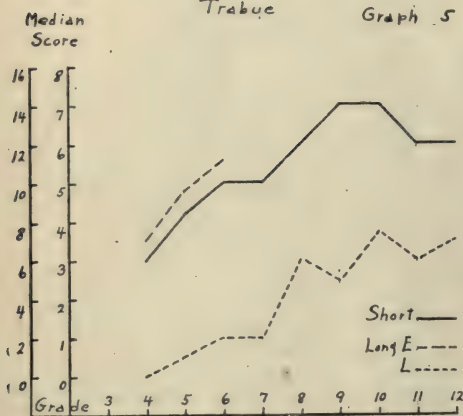
#### CORRELATIONS OF HOMOGENEOUS GROUPS

In working out the coefficients, each single class was first made a unit of comparison, except in a very few cases where the number in a class was too small to warrant getting a reliable coefficient, in which cases the small group was combined with another group near-

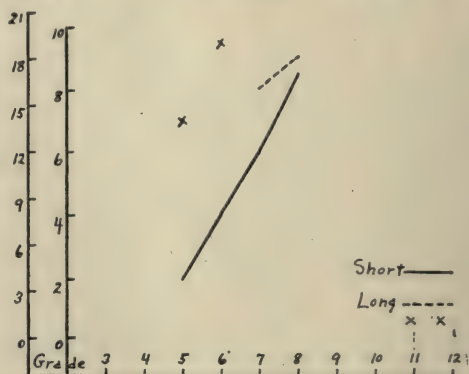




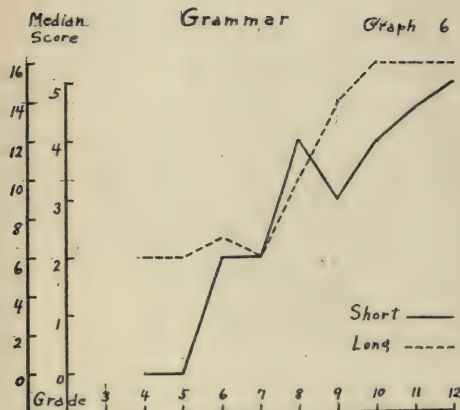
Trabue Graph 5



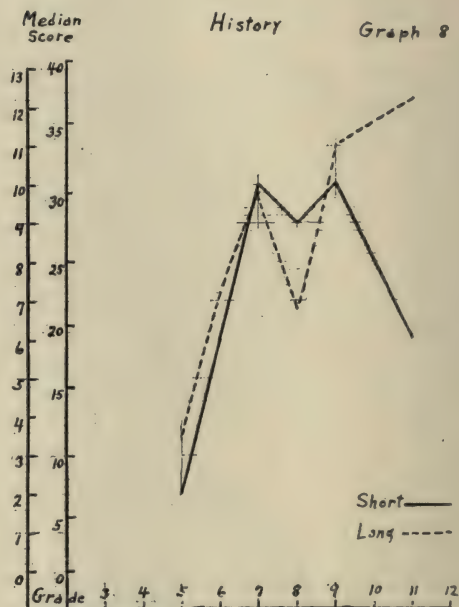
Geography Graph 7



Grammar Graph 6



History Graph 8



est like it, in the same school. The Spearman rank difference formula was used with these small homogeneous groups.

Table III gives the coefficients for each class in each school and for each of the tests. The numbers of cases used in each correlation are given in the column just preceding their corresponding coefficient. The averages of all the coefficients for each test have been found and are also presented in this table.

For the Vocabulary or Word's test, the coefficients range from .24 to .74, with an average coefficient of .48. The coefficients for Arithmetic range from .19 to .78 with seven out of nine groups showing correlations above .40, five above .50 and four above .60. Reading K gives a range of .15 to .83. Eight out of the eleven classes give coefficients above .40, seven above .50, and five above .60. For Reading T, the range is from .11 to .86, with nine of twelve coefficients above .40, eight above .50 and five above .60.

TABLE III. COEFFICIENTS OF CORRELATION.

School Grade	Words		Arith.		Read. K		Read T	
	No.	r.	No.	r.	No.	r.	No.	r.
E. Col. 4, .....	19	.64	18	.19	16	.71	14	.76
" " 5, .....	27	.37	23	.71	27	.15	22	.86
" " 6, .....	29	.40	25	.56	21	.48	21	.53
" " 7, .....	19	.74	14	.78	17	.83	18	.26
" " 8, .....	15	.24	13	.47	9	.54	9	.55
First Ave.								
3B .....			26	.60				
" 3A " .....					32	.66	30	.66
" 4B " .....			21	.67	35	.71	35	.62
" 4A " .....								
" 5B " .....					24	.66	26	.59
" 5A " .....	32	.66	31	.35				
" 6B " .....					25	.54		
" 6A " .....	27	.39	29	.48			27	.47
Fairfield								
H. S. ....	42	.64			34	.27	32	.26
W. Jeff.								
7 .....	18	.36					17	.11
W. Jeff.								
8 .....	19	.41					19	.60
Lane Ave.								
7 .....					12	.34		
Lane Ave.								
8 .....								
Total, .....	247	.59	200	.56	258	.65	240	.77
Average, .....		.48		.53		.51		.51

TABLE III (Continued).

School Grade	Trabue		Grammar		Geography		History	
	No.	r.	No.	r.	No.	r.	No.	r.
E. Col. 4, ....	13	.34						
" " 5, ....	23	.57	31	.09	30	.55	30	.55
" " 6, ....	21	.42	26	.36	26	.50	18	.87
" " 7, ....	17	.66	21	.90	21	.62	19	.62
" " 8, ....	8	.17	12	.17	12	.69	11	.43
First Ave.								
3B ....								
First Ave.								
3A ....								
" 4B ....	36	.51						
" 4A ....	31	.30	25	.48				
" 5B ....			24	.38	24	.41		
" 5A ....								
" 6B ....	24	.55						
6A ....								
Fairfield								
H. S. ....	33	.26	34	.41			11	.89
W. Jeff.								
7 ..... 17	17	.41					17	.57
W. Jeff.								
8 ..... 19	19	.60	35	.52			19	.81
Lane Ave.								
7 ..... 12	12	.60						
Lane Ave.								
8								
Total, .....	255	.55	208	.44	113	.55	125	.50
Average, .....		.45		.41		.55		.68

Trabue correlations extend from .17 to .66 with eight of twelve above .40 and six above .50. The coefficients in grammar range from .09 to .90; the four out of eight above .40, being .41, .48, .52 and .90. The geography coefficients run from .41 to .69; of the five coefficients, four are above .50 and two above .60. History correlations extend from .43 to .89. Of the seven classes compared six are above .50, five above .60 and three above .80.

The averages of all the coefficients for each test are shown in the last row of the Table. These average coefficients range from .41 (grammar) to .68 (history).



The next to the last row on the Table shows the correlation coefficients (Pearson's Product Moment) for all cases tested on both the long and the short scales. These larger and more heterogeneous groups show coefficients ranging from .44 (grammar) to .77 (reading T), denoting on the whole a very sensible degree of resemblance between the short and long scales.

In addition to this, comparisons were also made between several of the Long Scales with the total score of the Short form. The cases were ranked first according to the total scores for the short form, and then according to each of the scores for the long tests and the average of these ranks was found. This average rank represented the rank of the pupil on the long scale and was correlated with the rank according to the short form total score.

Twenty-four cases in a 5B class were used for comparing the total short form with the long scale, Reading Thorndike, Reading Kelly and Geography. The comparison showed a correlation of .716. The same cases, when the sum of the scores of only the Reading T, Reading K and Geography tests of the short form was compared with the sums of the scores of the corresponding long scales, gave .667.

Forty-three children in grades 5, 6, 7 and 8 took the short form and also the long scales, Visual Vocabulary, Arithmetic, Reading Kelly, Grammar and History. The average rank of these long tests was used with the rank according to the total score on the short form and a correlation coefficient of .84 was obtained.

Finally a comparison was made, using thirteen cases from grades 7 and 8, between all the long tests and the whole short form. The thirteen cases were the only ones in the entire number who had been tested, who had taken all the long tests and also the short form. The same rank method was followed here, and the correlation coefficient was .80.

It is reasonable to conclude, therefore, that a correlation of between 75 and 85 is very likely a true measure of the short form as compared with the several standard forms. The more of the latter that are used the closer will be the agreement with the rating of the short scale up to a certain point. The use of all the long standard forms will unquestionably give a more accurate pedagogical picture of a pupil than our shortened scale, but on the other

hand given only thirty minutes within which to sum up a pupil's pedagogical knowledge, the short form will be infinitely better than anything that could be achieved by any of the long forms within the same amount of time. Although several of the correlation coefficients are fairly low, we must remember that this is the case only when we compare each subject of the short scale. This is a very severe test of each particular part of the scale. Furthermore, comparing a more or less homogeneous group such as is contained in any one grade, we hereby increase considerably the severity of the test. Remembering these things, it is surprising and gratifying to find the short form always giving positive and nearly always giving reasonably high coefficients. Since, however, in actual practice the short scale will always be used as a whole and never in parts we may conclude that it will give us a fairly good measure of an individual and a very good measure of a grade and unquestionably as accurate a measure of a whole school as could be obtained by the use of several long scales involving days and days of testing.

On the other hand, it is not intended for use by the teacher who is seeking detailed and accurate knowledge of her pupil's ability in any one subject or who is planning to use Educational Measurements for diagnosing the particular difficulties and weaknesses of her students.

### CONCLUSIONS

1. The shortened form of the standard educational measurements gives correlation coefficients ranging from .41 to .68 when the separate tests in the scale are compared with the corresponding long scales from which they were derived. The inference from this fact is that the separate parts of the short scale are reliable measures of attainment in the separate subjects which they attempt to measure, and that fairly good results will be obtained if the object is to ascertain individual differences in the separate school subjects. At least the results will indicate where further investigation would be necessary or profitable.

2. When the total result of the short form is compared with the total of the results of the long scales a coefficient of about .786 is obtained, indicating an excellent correlation. This means that prac-

tically the same results will be obtained by the use of the short form as by the use of the separate long scales, if a measure of general attainment is desired.

3. The short form represents economy in time, labor and cost. The following table shows the time required to give and score both the long scales and the short form for one class of thirty pupils.

Long Scales.		
Scale	Mins. Required to Give	Mins. Required to Score
Words, .....	20	20
Arithmetic, .....	80	240
Reading K, .....	5	30
Reading T, .....	30	45
Trabue, .....	7	30
Grammar, .....	15	30
Geography, .....	30	60
History, .....	45	45
Total, .....	232	500
Total (giving and scoring) 732 minutes=12+ hours.		

Short Form.		
Scale	Mins. Required to Give	Mins. Required to Score
Total, .....	30	30
Total (giving and Scoring) 60 minutes=1 hour.		

This shows a saving of eleven hours time for every class of thirty pupils tested by the short form. In a single school of twelve such classes the saving of time would amount to one hundred and thirty-two hours, and in a school system of five such schools, the saving would amount to six hundred and sixty hours. This economy of time represents the same economy of labor. The economy in cost is evident also, both in the cost of labor and of test material.

4. The short form makes possible greater efficiency in administration and supervision, for it includes in a single value the measure of the pupil's attainment in general education and puts it on a comparable basis with his measure of capacity in general intelligence.



# Results of the Bell Chemistry Test

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LATE in March, 1920, the Bell Chemistry Test<sup>1</sup> was given to 27 pupils in the Reading, Pennsylvania, Boys' High School, and to 11 pupils in the Horace Mann High School for Boys, of Teachers' College, Columbia University. As an addition to Bell's tentative standards, the results are here reported in Table I.

TABLE I.

Showing the Scores in Bell Chemistry Test for 38 Boys, March, 1920.

Score	Number of Pupils Reading	Horace Mann
41, .....	1	
44, .....	1	
46, .....	1	
48, .....	2	
53, .....	1	
54, .....	1	
55, .....	2	
56, .....	4	
57, .....	2	
59, .....	3	
60, .....	2	
61, .....	3	
63, .....		1
66, .....	1	
67, .....		1
70, .....		1
71, .....	1	
75, .....		2
77, .....	1	
82, .....		1
85, .....		2
88, .....		1
89, .....	1	1
91, .....	1	1
Totals, .....	27	11
Median, .....	57.25	82.5
Average, .....	57.96	79.09

Although the pupils tested had studied chemistry for only a little over six months, their scores compare favorably with those of the Texas pupils who had pursued the subject for eight months. This

<sup>1</sup> Journal of Educational Psychology, Vol. 9, 1918, 199.

suggests that Bell's tentative scores may be low. The list should be applied to a number of other pupils in different states.

In order to secure some measure of reliability of the test, correlations were made between the scores, the marks of the pupils in chemistry for the first semester, and the estimates by the teachers of the pupils' knowledge of chemistry at the time the list was given. The correlations between the last two items are of course spurious, as the ranks come from the same source; but they serve to indicate something of the unreliability of teachers' judgments. The results are shown in Table II, the P. E.'s being given in parenthesis. As not all of the pupils considered received three marks, the numbers involved vary slightly.

TABLE II.

Showing the coefficients or correlation  $[r = 1 - \frac{6\sum d^2}{n(n^2-1)}]$  between scores in the  
Bell Chemistry Test, Semester Marks, and Teachers' Estimates of  
the Pupils' Knowledge of the Subject.

Marks	Teachers' Estimates	Marks	Teachers' Estimates
.300 (P.E. .214)	.388 (P.E. .197)	Test	.414 (P.E. .117)
	.557 (P.E. .121)	Marks	.352 (P.E. .126)
			.871 (P.E. .029)

These raw coefficients may be interpreted as showing that the test is a fairly good measure of a class knowledge of chemistry; but a study of the detailed pairings indicate that it is unreliable for an individual. Satisfactory high relationship between the results of the test and teachers' marks can not be expected when the coefficient between a teacher's marks and estimates runs as low as .56.

As in the original article Bell did not give a scoring sheet and as that used in Texas has been lost, one prepared by Mr. Robert F. Payne is appended for the convenience of others desiring to use the test.

#### BELL CHEMISTRY TEST

1. What chemicals are liberated in the electrolysis of water?
2. What gas is given off by the action of yeast in bread dough?
3. Name two chemicals used in making oxygen.
4. Express in cubic centimeters, one liter.
5. Name two substances used in making hydrogen.
6. Define oxidation.

7. Define reduction.
8. Name four processes of purifying water.
9. What is a deliquescent substance?
10. Name two gases either of which might be used to bleach cloth or flowers.
11. Name two very common organic acids.
12. Name two chemical compounds used in making common salt.
13. Write the reaction for sulphuric acid on potassium hydroxide.
14. Name the two most abundant elements in the atmosphere.
15. Name two commercial sources of ammonia.
16. Is air a chemical or a physical mixture?
17. Why does ammonia water always feel cold when it comes in contact with the hands?
18. Name the substances used to make aqua regia.
19. Name four basic hydroxides.
20. Name the commercial uses of the nitrates.
21. What are the properties of carbon bisulphide?
22. Give the chemical name of:  $\text{CaSO}_4$ .....  
 $\text{H}_2\text{S}$ .....  $\text{Na}_2\text{SO}_3$ .....
23. What is the calence of: H....., O....., Ca.....,  $\text{SO}_4$ .....
24. Name the members of the Chlorine group.
25. How many grams of water are formed by the combustion of 10 grams of hydrogen in air?

#### CORRECTION SHEET FOR BELL CHEMISTRY TEST

Allow 4 credits for each correct answer. 1, 2, or 3 credits for partially correct answers. Avoid fractional credits by marking to the nearest full unit.

*Possible*

<i>Credit</i>	<i>Question</i>	<i>Answer.</i>
4-2-0	1	Hydrogen and oxygen. $\text{H}_2$ & $\text{O}_2$ . H & O.
4-0	2	Carbon dioxide. $\text{CO}_2$
4-2-0	3	Potassium chlorate, Manganese dioxide, Mercury oxide, Barium oxide. (Any two.)
4-0	4	One thousand cubic centimeters. 1000 cc.
4-0	5	Zinc or Iron and Sulphuric acid. (Any common acid.) Sodium or Potassium and water. (Also accepted.)



- 4-0            6    Oxidation is the combining of oxygen with an element or compound.  
Oxidation means increase in valence. (Also accepted.)
- 4-0            7    Reduction is the taking away of oxygen from a compound.  
Reduction means decrease in valence. (Also accepted.)
- 4-3-2-1-0    8    Filtration, boiling, freezing, distillation, sedimentation, chemical treatment. (Any four.)
- 4-2-0           9    A deliquescent substance is one that absorbs moisture from the air (2 point credit) to such an extent as to become liquid. (Full credit.)
- 4-3-2-0       10   Chlorine, Sulphur dioxide,—*Nascent* or *atomic* Oxygen. (For failure to specify nascent or atomic deduct one point credit.) (Any two.)
- 4-2-0         11   Acetic, tannic, citric, lactic, oxalic, etc. (Any two.)
- 4-0            12   Sodium hydroxide and Hydrochloric acid.
- 4-0            13    $2\text{KOH} + \text{H}_2\text{SO}_4 \rightleftharpoons \text{K}_2\text{SO}_4 + 2\text{HOH}$ . (No deduction for failure to balance equation.) (Word equation accepted.)
- 4-2-0         14   Nitrogen and Oxygen.
- 4-2-0         15   From distillation of soft coal. Direct union of nitrogen and hydrogen by electricity.
- 4-0            16   Physical.
- 4-0            17   Because the rapid evaporation takes up heat.
- 4-0            18   Nitric and Hydrochloric acids. (No credit unless both are correctly given.)
- 4-3-2-1-0    19   Sodium hydroxide, Potassium hydroxide, Ammonium hydroxide, Calcium hydroxide, Aluminum hydroxide, etc. (Any four.)
- 4-2-0         20   Fertilizers and Explosives.
- 4-3-2-1-0    21   Volatile liquid—strong odor—slight yellow in color—good solvent for many substances—somewhat inflammable.

4-3-2-I-O	22	CaSO <sub>4</sub> ...Calcium Sulphate. H <sub>2</sub> S...Hydrogen sulphide. Na <sub>2</sub> SO <sub>3</sub> ...Sodium sulphite.
4-3-2-I-O	23	Valence: H...One. O...Two. Ca...Two. SO <sub>4</sub> ...Two.
4-3-2-I-O	24	Fluorine, Chlorine, Bromine, Iodine. (No deduction for failure to <i>rename</i> Chlorine.)
4-O	25	90 grams.

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## EDITORIAL

FOR the past ten years the dull or backward child has received a great deal of attention from school authorities. The study of age—grade tables has revealed his numerical frequency, and the judgment of teachers supported by the Binet and other tests has picked him out individually. He has been specially classified in small, selected classes, he has been given exceptionally well trained and highly paid teachers, and no effort has been spared to give him the education of the normal child. The results from an educational point of view are far from satisfactory. With the greatest trouble and effort he masters only a fractional part of the normal course of study, and as soon as he escapes from the school environment he forgets practically all he has learned. The simple manual occupations which he can learn may serve to keep him busy, but usually are of little value



for a productive livelihood. So great is the discrepancy between effort expended and value received, that many are beginning to question the advisability of trying at great cost to educate the natively ineducable, and to urge concentration of attention upon more promising material.

It is now pretty generally admitted that the gifted child in our public schools has been neglected. Terman declares that no child in the schools is so seriously retarded as the gifted child. One reason for this is the wide-spread popular belief that precocity in childhood presages stupidity in later life. Many parents deliberately try to retard their bright children in order to lay a better foundation, as they think, for future success. Intellectual measurements show that this view is entirely fallacious, that the intelligence quotient is practically constant, at least through adolescence, and that, other things being equal, no harm can come from the judicious encouragement of native aptitudes. Another reason for the neglect of the bright child is the commonly accepted doctrine of teachers that he does not need any special attention, that he will always be able to look out for himself. In a certain sense this, of course, is quite true. With ordinary attention to class work and with a reasonable amount of application the bright child will surpass the median of the class, and will do more than meet the general requirements for a passable standing. But to rest content with this spells retardation, for the superior native capacities of the bright child demand higher standards of expectation than those set for the average of the class.

This brings us face to face with an important question of educational policy. In the past the public school has rather prided itself upon the application of a single standard to all pupils. This standard was necessarily an average one, or one which a large majority of the pupils could be expected to attain. In other words the whole effort of the school was directed to the attainment of mediocrity. This was defended in the name of democracy, and the single standard public school was lauded as the bulwark of democratic ideals. But does not modern democracy call for more than mere mediocrity? Does it not demand a recognition of individual differences, and the utmost development of each individual's potentialities? If this is so, the single standard, the uniform course of study will no longer suffice. Not only must we have different requirements for

different groups of pupils, but each individual must be considered in the light of his potential contribution to society. The child who is especially gifted in music or drawing or playing baseball should have a special curriculum constructed for him, emphasizing those activities which will contribute to the development of his gift, and minimizing work in arithmetic, spelling, handwriting and other subjects which are of little value to him or to society.

J. C. BELL.

## NOTES AND NEWS

An extensive investigation to determine whether there is any effect of tobacco upon the intellectual processes is being conducted under the direction of Professor M. V. O'Shea, of the University of Wisconsin. Several lines of investigation are being pursued. Experimental work in the psychological laboratories of the University of Wisconsin was begun last June and will continue for many months to come. This work is in immediate charge of Dr. Hull, who has charge of experimental psychology in the University, aided by a number of assistants. A technique has been worked out for this investigation which eliminates the factor of suggestion and enables the investigators to study the effect of tobacco alone. In addition to the laboratory investigations the records of a large number of pupils who smoke in high schools and colleges is being compared with an equal number of non-smokers. The records are transcribed beginning several years before the smokers began smoking and are brought down to the present time so that if any influence is exerted by tobacco it can be traced through a number of years. Data concerning other factors which might influence scholarship in the case of each pupil are secured and it is expected that it will be possible to determine the effect of tobacco as distinct from all other factors. The principals and superintendents and directors of research in a number of cities throughout the country are co-operating in securing data for this phase of the investigation. Other lines of study are being carried on, all of which are designed to obtain data supplementary to the laboratory studies and investigation of the scholastic records. The physiological effects of tobacco are being investigated by Professor Cannon, of the Harvard Medical School; Dr. Hooker and Professor McCollum, of Johns Hopkins University; Professor Erlanger, of Washington University; Professor Martin, of Stanford University; and Professor Brooks, of New York University. Professor Farnam, of Yale University, is studying the economic aspects of the tobacco problem.

The Pennsylvania Special or Fitting Class Act, passed last year, provided for the physical and mental examination of all children between the ages of eight and sixteen who are seriously retarded in their school work or who fail to profit by the ordinary school instruction. Special education is to be provided for such children, the state appropriating one-half the cost. The Mental Hygiene Committee



of the Public Charities' Association is conducting an active campaign for the enforcement of the law, and under the leadership of Dr. Norbert Melville, is endeavoring to arouse the public to the importance of this work for public education.

Dr. Paul R. Stevenson, director of the Bureau of Research, University of Omaha, has devised an Omaha Group Test of Intelligence. The series consists of eight tests containing from five to fifteen exercises each. The tests are likeness and difference discrimination, correction of statement, arithmetical problems, disarranged sentences, following directions, synonyms—antonyms, analogies, and range of information. The series requires only twenty minutes to give and is intended for use in grades three to eight and in the first year in the high school. A feature of the directions to each test is the omission of one or more crucial words which are to be written in at the dictation of the examiner, thus preventing any pupil working ahead. Tentative norms are indicated in a folder accompanying the tests.

The March meeting of the New York Society for the Experimental Study of Education was devoted to the consideration of "Problems in the Standardization of Penmanship Teaching." Mr. Clyde C. Lister described the "Steps Toward Standardizing the Teaching of Penmanship in New York City Schools"; Mr. Eugene A. Nifenecker gave an account of an investigation in representative elementary schools to establish norms of accomplishment for the different grades on the basis of the New York City Penmanship Scale; Miss Lizzie E. Rector spoke on "Standardization as an Aid in Teaching Penmanship"; and Mr. Morgan J. Goldsmith emphasized "The Need of Standardization in Penmanship."

At the meeting of the New York Branch of the American Psychological Association, at Columbia University, on March 1, the following papers were presented: "Responses of Sane and Insane to the Ball-and-Field Test," Professor L. S. Hollingsworth; "The Intelligence of Troops Infected with Hookworm," Dr. Garry C. Myers; "Should Teachers Use the Stanford Revision? A Discussion of Terman's 'Intelligence of School Children,'" Dr. Francis N. Maxfield.

The Seventh Annual Conference on Educational Measurements will be held at Indiana University, April 23 and 24. The principal speakers from abroad will be Professor E. L. Thorndike, of Colum-

bia University, and Professor C. E. Seashore, of the University of Iowa. Professor Thorndike will speak on the following topics: "Measuring Educational Forces," "The Danger of Indiscriminate Use and Misuse of Educational Tests," "The Task of the Elementary School," "The Use of Intelligence Examinations for College Entrance," and "The Standardization of Textbooks." Professor Seashore will give two addresses: "The Analysis of the Musical Mind for the Purpose of Rating," and "The Discovery and Encouragement of Musical Talent in the Public Schools by Means of Measurement." Other papers will be: "The Relation between Intelligence and Achievement in the Second Grade," by Mrs. Sidney L. Pressey; "A Symposium on Educational Research," directed by Professor H. G. Childs; "A State-wide Mental Survey of High School Seniors in Indiana," by Professor W. F. Book; and "Needed Modifications in the School Curriculum and Standard Tests," by Professor W. W. Black.

Beginning with the May number *The Educational Review* will be under the editorship of Dean Frank P. Graves, of the school of education, University of Pennsylvania.

Mr. Robert H. Lane, of the Department of Educational Research, Los Angeles Public Schools, has been made assistant superintendent.

Lieutenant Schachne Isaacs, psychologist in the Air Service, Medical Research Laboratory, Mitchell Field, Long Island, has been awarded the fellowship in psychology offered by the Society for American Fellowship in French Universities.

## PUBLICATIONS RECEIVED

ELLWOOD P. CUBBERLEY. *Public Education in the United States*. Boston: Houghton Mifflin Company, 1919. Pp. xxvi, 517. \$1.80.

This is a history of education in America, yet much more than a mere history of education. It is also a survey of present tendencies in education, and an evaluation of the forces that are making themselves felt along new lines. Indeed the book might well be called a discussion of contemporary education in its historical setting. This is no chance product of professorial inspiration, but, as the author indicates in the preface, it is a deliberate effort to meet the criticism that the traditional history of education fails to function, and to present something that will have vital and manifold points of contact with present problems. The first four chapters deal with the earlier influences in American education; the next three describe the great battle for free, state-supported schools; chapters 8, 9, 10, and 11 discuss the new ideas in education since 1860; while the remaining four chapters deal with such topics as differentiated courses of study, education of defectives and delinquents, child welfare, vocational education, the scientific movement in education, reorganization of the high school, Flexner's "Modern School" proposal, consolidation of rural schools, and the present trend toward the nationalization of education. It is masterful book and packed from cover to cover with good things forcefully stated.

JUNE E. DOWNEY. *The Will-Profile: A Tentative Scale for Measurement of the Volitional Pattern*. University of Wyoming Bulletin, Vol. 15, No. 6A, 1919. Pp. 38.

This is an interesting attempt to work out a scale for those forms of behaviour that give indications of the mechanism of conscious control. There are ten tests in the scale. 1. Checking of paired traits to express individual judgment of one's own character. 2. Writing own name under four different control conditions. 3. Choosing one of two sealed envelopes, each of which contains directions for a mental test, the one hard, the other easy. 4. Writing a phrase as quickly as possible on a line of given length. 5. Writing the same phrase under varying conditions. 6. Disguising handwriting, first by changing either slant or size, second in any other way without modifying slant or size. 7. Imitating a model, first as



rapidly as possible, second as exactly as possible. The same with a second model. 8. Writing name under four different types of distraction. 9. Resistance to suggestion (about envelope chosen in 3). 10. Blocked writing. Elaborate directions are given for scoring the tests, and sample will-profiles are presented from a collection of over two hundred.

CHARLES A. ELLWOOD. *Sociology and Modern Social Problems*. New Edition. Cincinnati: The American Book Company, 1919. Pp. 416.

This discussion of social problems is based on the nature of the family and its wide-spreading relations. The first three chapters are introductory, and deal with the study of society and the bearing of the theory of evolution and of modern psychology upon social problems. Chapters four to eight treat of the family proper, its function, origin, forms, historical development, and the problems of the modern family. Later chapters discuss the growth of population, the immigration problem, the negro problem, the problem of the city, poverty and pauperism, crime, socialism, education and social progress. It is a very readable book, and deserves wide circulation among teachers.

GUY G. FERNALD. *The Defective-Delinquent Class: Differentiating Tests*. Second Edition. Reprinted from American Journal of Insanity, April, 1912. Pp. 523-592.

It is significant of the interest in mental tests that Dr. Fernald has found it desirable to have another reprint made of his article of eight years ago. Of the twelve tests tried in this series the following six were retained as significant: Weight discrimination, ethical discrimination, achievement capacity, extent of movement, ethical perception, and calculation. There is a tabulation of the results of these tests on one hundred delinquents and a history of each case.

*Fifth Conference on Educational Measurements*. Indiana University, Bloomington, Indiana. December, 1918. Pp. 140.

The principal speakers at this conference were Professor Guy M. Whipple and Professor Edward L. Thorndike. Professor Whipple spoke on the following topics: "The Problem of Selecting and Training Gifted Children in the Public Schools," "Some Further Possibilities of Mental Testing," and "The Development of Methods of Group Examination of the Intelligence of Adolescents." Pro-

fessor Thorndike discussed "Tests for Vocational Selection," "Application of Vocational Tests to Present School Problems," and "Recent Developments in Educational Measurements." Dr. Sidney L. Pressey explained "A Systematic Plan for Selecting Subnormal and Supernormal Children in the Public Schools" and Professor W. F. Book spoke on "Variations in Mental Ability and Its Distribution Among the School Population of an Indiana County."

JESSE KNOWLTON FLANDERS. *Mental Tests of a Group of Employed Men Showing Correlations with Estimates Furnished by Employer*. Reprinted from *The Journal of Applied Psychology*, Vol. 2, 1918, 197-206.

Forty-seven employees of an express company were tested by the Stanford-Binet tests, and the result correlated with school grades completed, occupational status of father, salary, intelligence rating by superiors, accuracy, all-round efficiency, length of service, speed, age, cooperativeness, dependability, and loyalty. The ratings in many of these were based on the combined judgments of three superiors. The correlations were very low, the highest being with school grades completed, .44.

W. H. FLETCHER. *Concrete Geometry in the Junior High School*. Reprinted from *School Review*, 27:1919. 441-457.

A description of a course in concrete geometry as it is presented in the seventh grade of the training school of the Oshkosh State Normal School. Construction of figures plays a large part in the course.

GUSTAVE GELEY. *De L'Inconscient au Conscient*. Paris: Librairie Felix Alcan, 1919. Pp. xiii, 346. 11 fr.

This is a courageous attempt to develop a philosophy of the individual based on the analysis and synthesis of all the principal facts of the natural sciences, biology, physiology, and psychology. The first part of the book is critical, and attacks current conceptions of evolution, of the physiological individual as a complex of cells, and of the psychological individual as a summation of conscious neurones. The essence of the psychological individual is the subconscious. The author does not believe in the vitalism of Bergson, but assumes what he calls "an essential dynamo-psychism," or blind vital urge, which by a hierarchy of representations mutually conditioning each other develops into the conscious individual. These representations, according to the author, are shown by the phenom-

ena of the subconscious to be different from the individual itself, superior to the organism, conditioning it but not conditioned by it. They are the direct result of the creative dynamo-psychism. What a dynamo-psychism is, how it could create such things as representations, and how these representations could constitute an individual, are problems for the solution of which the reader is referred to the arguments of the book.

ARNOLD GESELL. *What can the Teacher do for the Deficient Child?* Connecticut State Board of Education, 1918. Pp. 47.

This little brochure is presented as a brief manual of explanations and suggestions concerning extremely backward children in rural, village and city schools who cannot have the benefit of training in a special class. It contains a primer of questions and answers on mental deficiency, illustrative cases of deficient school children, and suggestions for a special program for the deficient child.

HENRY H. GODDARD. *Psychology of the Normal and Subnormal*. New York: Dodd, Mead and Company, 1919. Pp. xxiv, 349. \$5.00.

This is a very stimulating book, both on account of the nature of some of the positions taken, and on account of the clearness and definiteness which characterize the discussion. The author insists that psychology is the science of mind, and that mind determines human conduct. This would seem to exclude him from the new behaviorist school, and group him with the introspectionists. This, however, would be directly contrary to the entire trend of the argument. In no textbook in psychology will there be found more numerous diagrams of the elements of the nervous system. The entire account of mental life is couched in neural terms. Even in the consideration of such topics as attention, association, and thinking there is little reference to introspection, and great stress is laid upon the study of objective behavior. The great advances in modern psychology, says the author, are found not in the laboratories for adult human psychology, but in the study of animal behavior, in child-study, and above all in the study of the behavior and the neural organization of the feeble-minded. One of the most significant arguments developed in the book is the view, first advanced by Mosso, that the emotions depend primarily upon the sympathetic nervous system, and are brought under control only through the interaction of the sympathetic and the cerebro-spinal systems. This view is supported with great skill by citations from the recent studies of Cannon on the physiology of the emotions.



SAMUEL HAMILTON. *Essentials of Arithmetic*. Cincinnati: American Book Company, 1919. First Book, Pp. 368. Second Book, Pp. 432.

The author's aim in these texts is to give the pupil such a mastery of number combinations and processes as will enable him to perform with accuracy and speed all common numerical operations, and to train him in the skillful application of these processes to the problems that he is likely to meet in his daily experiences.

SAMUEL P. HAYES. *Report of a Preliminary Test of the Reading of the Pupils of the Pennsylvania Institution for the Instruction of the Blind at Overbrook, Pa.* Published by the Institution, 1918. Pp. 20.

This is a study and analysis of the rate at which blind pupils read, a search for the factors involved in failure or success in reading, and an establishment of tentative standards of reading rate for different grades and years of experience with Braille. The Courtis Standard Silent Reading Tests were printed in Braille and given to 103 blind pupils. There was a wide range of reading rate, the speediest reading more than ten times as many words per minute as the slowest. The median was 62 words per minute, which is not more than one-third as fast as seeing children of the same ages. There is an interesting analysis of the mechanics of touch reading with the promise of more detailed experimentation later. Practice and mentality are the chief causes for the differences in attainment shown.

PIERRE JANET. *Les Medications Psychologiques. Etudes historiques, psychologiques et cliniques sur les methodes de la psychotherapie*. Paris: Librairie Felix Alcan, 1919. Two volumes. Vol. I. *L'Action morale, l'utilisation de l'automatisme*. Pp. 346. 13.20 fr. Vol. II. *Les Economies psychologiques*. Pp. 308. 13.20 fr.

These two volumes contain the lectures delivered by the author at Harvard University in 1904-06 and at the College de France in 1907. The first volume presents studies in so-called mental healing, including miraculous religious cures, the practices of Christian Science, and the methods of various faith healers. The second part of this volume is a discussion of hypnosis, suggestion, and the appeal to the automatic in the treatment of disease. There is a historical discussion of hypnotism in which the differences between the author's theories of hypnosis and those of Bernheim of Nancy

are set forth. A more precise definition of suggestion is then developed, the conditions of suggestion are discussed, and the relation of suggestion to hypnotism is considered. In the second volume various aspects of the rest cure for nervous diseases are discussed, the methods of isolation and their effects are considered, and the procedures of the psychoanalysts and the re-educationists are evaluated. While the lectures were originally prepared fifteen years ago, some account is taken of the more recent discussions in the fields considered.

W. FRANKLIN JONES. *A Study of Handedness*. Vermillion, S. D.: University of South Dakota, 1918. Pp. 80.

The problems underlying this investigation are (1) How can we determine whether a child is born right or left handed? (2) How can we distinguish born handedness from acquired handedness? (3) Should the lefthanded child be "transferred" to the right hand? The author answers the first two questions as follows: "Born handedness is revealed by the measures of the bones of the arm, the major arm having the larger bones; adopted handedness is shown by the muscle swell, the adopted, or preferred, arm having the higher percentage of muscle swell. These conclusions rest upon the arm measurements of twenty thousand individuals. Detailed tables are given of the measurements of 200 right-handed persons, 40 left-handed persons, and 60 "transferred" persons. Ninety-six per cent. of the human race are born right-handed and four per cent left-handed. Seventy-seven per cent of all born left-handers are "transferred" to the right hand. One-half of all stammerers are "transfers," and one-third of all left-to-right "transfers" are stammerers. Hence it would seem that the process of "transfer" brings about a disorganization of the nervous system which is apt to show itself in speech disturbances.

WILLIAM A. LOCY. *The Main Currents of Zoology*. New York: Henry Holt and Company, 1918. Pp. vii, 216.

The ordinary treatise on zoology gives a great many facts about animals, their classification, their structure, their habits, and so on, but there is little opportunity for the student to appreciate the general significance of the subject and its bearing upon social life. In order to comprehend zoology in the light of its progress, it is necessary to trace its main currents. The present book is intended as collateral reading for courses in practical biology, but also it will enable the general reader to appreciate something of the importance of zoology for the general affairs of life.

## THE JOURNAL OF EDUCATIONAL PSYCHOLOGY

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### Graded Opposites and Analogies Tests

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OCASIONS frequently arise in connection with vocational testing and in laboratory experiments where several tests of the same type and of approximately the same degree of difficulty are desirable. To meet just such a circumstance it was found necessary to devise a series of opposites tests and a series of analogies tests of approximately equal difficulty and having a fairly high degree of correlation with one another within the same series.

The initial stage consisted in the preparation of a list of some three hundred sets of analogies. These were given to 142 sixth and seventh grade pupils and also to 122 college juniors and seniors. At the same time a list of about the same number of stimulus words were prepared as a basis for the construction of the opposites tests and given to 148 sixth and seventh grade pupils and to 54 college juniors and seniors. The stimulus words for the opposites tests and the sets of stimulus words for the analogies tests were given orally in sets of fifty each. The subjects were allowed a constant time in which to think of and write down the responses on blanks especially prepared for the purpose. The relative degrees of difficulty of the tasks were thus determined on the basis of the frequencies with which adequate responses were given when the time was kept constant. In the case of the opposites material the stimulus words were given at the rate of four seconds each, which allowed just a little less than four seconds for thinking of and writing down the opposite thought of. With the list of analogies the three stimulus words were read one second apart, which gave three seconds for thinking of and recording the response. In order to eliminate any undesirable effects of practice or fatigue the stimulus tasks were given in different orders to different groups. Also adequate rest periods were



provided between each of the several lists of fifty stimuli to insure a maximum degree of effort throughout the whole series.

After all the responses to each stimulus word or set of stimulus words had been assembled they were mimeographed and submitted to thirteen students in an advanced class in educational psychology to be rated for the degree of correctness or adequacy. The judges were instructed to give full credit to all responses considered fully adequate; to those considered only partially correct a half credit was to be given; and to those considered inadequate no credit was to be assigned. On the basis of the ratings of these thirteen mature people the adequacy of the several responses to each stimulus word or set of stimulus words was determined in the following manner. A response was accepted as an adequate response if at least nine of the thirteen judges considered it as wholly adequate. Those responses which were judged as at least partially correct by not less than nine of the thirteen judges were given one-half credit. All other responses were assigned zero credit.

The next step was to give each stimulus word or set of stimulus words a value based upon the frequency with which the adequate and partially adequate responses were given by the different groups of subjects. Inasmuch as the easier stimulus words or sets of stimulus words were for the most part too simple for the college students, only a small degree of discrimination was evident on the basis of their responses. The same was true of the more difficult stimulus words and sets of stimulus words in the case of the elementary school children. To obtain a more reliable evaluation of the relative difficulties of the stimuli the frequencies of the sixth and seventh grade responses were weighted or multiplied by three in the case of the simpler stimuli, and by two in the case of those of medium difficulty. At the same time the frequencies of the college students' responses were multiplied by three for the more difficult responses and by two for those of medium difficulty. After the weightings had been made, the weighted frequencies of the two groups were combined and a final value assigned to each stimulus word or set of stimulus words. The stimulus words for the opposites tests and the sets of stimulus words for the analogies tests were then arranged in tables according to their relative degrees of difficulty.

Peter Sandiford

Before proceeding further in the construction of the tests it seemed essential to discard from the two series all stimulus words or sets of stimulus words which would be noticeably displaced if the weightings used were either changed or even dropped. This process eliminated those stimuli which were disproportionately easier for the younger group of subjects than for the older group or disproportionately more difficult for the more mature group of subjects than for the less mature group. At the close of this sifting process the remaining stimulus words and sets of stimulus words were arranged into four series so that each series presented practically the same degree of difficulty at each step. At a very few places it was necessary to use the same stimulus word in two different series. The final result was four series of fifty stimulus words for the opposites tests and four series of fifty sets of analogies, each series of approximately the same difficulty at each step and ranging from very easy stimuli to stimuli difficult enough to tax college students.

After the four series of opposites and analogies tests had been printed and labeled A, B, C, and D respectively, they were given to about 150 high school sophomores to determine the relative difficulty of the several series. In order to compensate for any influence of practice or fatigue the tests were given in different orders to different sections of the Sophomore group, one fourth being given the tests in the order A, B, C, D, a second fourth in the order B, C, D, A, a third fourth in the order C, D, A, B, and the fourth group in the order D, A, B, C. As a result of this trial it was found that series A, B, and C were of approximately equal difficulty at the 25-percentile point, at the median, and at the 75-percentile point, the variations being not more than two adequate responses. The fourth set, the D series of opposites and the D series of analogies, were somewhat more difficult than the other three series, varying by as much as six adequate responses. The D series have been included, however, as they may be of use even though not of the same approximate difficulty as the other series.

By taking the consecutive tests where they followed each other in the same order it was possible to determine the correlations between each pair of tests of the same type on the basis of approximately seventy-five scores without any interference due to the effects of practice. For the four analogies tests the intercorrelations ranged from  $+.83$  to  $+.89$ , while for the four opposites tests the inter-

In the sections that follow are given the directions used in giving these tests to the sophomore high school students and to other groups of individuals, including high school freshmen and college sophomores, the four series of analogies followed by the keys, and the four opposites tests with their keys. A response preceded by a 2 in the keys should be allowed full credit. When a 1 precedes the response only one-half credit should be given. All responses preceded by a 0 should receive no credit. Although from fifty to two-hundred-fifty responses were assembled for the greater part of the stimulus words or sets of stimulus words, other responses may be expected. The responses given in the keys will, however, allow such additional responses to be evaluated with a high degree of accuracy.

The following set of directions appeared on the front page of each set of tests, the set consisting of one analogies test and one opposites test:

### DIRECTIONS

Fill out these blanks and read the directions that follow them.

Name ..... Sex ..... Age .....  
 ..... Years Months  
 School ..... Class ..... Date .....

On pages 2 and 3 you will find 50 groups of three words each followed by a blank space. In these blank spaces you are to write a fourth word which has the same relation to the third word of the group as the second word has to the first word of that group. The following are samples:

color	—	red	name	JOHN
page	—	book	handle	KNIFE
chew	—	teeth	smell	.....



On page 4 you will find a list of fifty words followed by blank spaces. In these blank spaces you are to write words that mean exactly the opposite of the printed words. The following are samples:

hard	<i>SOFT</i>
bravery	<i>COWARDICE</i>
long	.....

If you do not think of the proper word in any case within ten seconds go on to the next group or word.

Do NOT open or turn over this paper until the instructor tells you to do so.

These directions were read to the subjects, as they read them silently, as far as through the samples for the analogies, sufficient time being given them to fill in the blank spaces. Care was also taken that each subject understood just what to do before proceeding with the test. The note at the bottom of the page was then read, and the subjects were further told: "When I say start, open the sheet to page 2, begin with task number 1, and go as far as you can before time is called, at which signal you will turn back to the first page again. When you have finished through the 25th on page 2 go at once to the 26th task at the top of page 3. Ready, start!" At the end of four minutes the subjects were told "Stop. Turn back to the first page, and beginning just below the middle of the page, read the directions." These were read with the students as before, care being taken that each subject comprehended the nature of the tasks to be done. At the close they were told, "When I say start, turn to the back page, page 4, and beginning with number 1, go as far as you can before time is called, at which signal you will again turn back to the first page. Ready, start!" At the end of four minutes the subjects were told "Stop. Turn back to the first page again."

In the case of all groups of subjects it is advisable to ask the group what other words can be used in the case of the first two samples. If any wrong responses are given the error in the response should be clearly pointed out. The responses to the third sample should be written on the board and all errors made clear before beginning work on the test itself. For elementary school pupils of grades five to eight and for high school pupils four minutes should be allowed for each test. For freshman and sophomore college students three minutes is sufficient time, while two and a-half minutes is adequate for college juniors and seniors.

## KEY TO ANALOGIES A

- |                               |             |                                      |
|-------------------------------|-------------|--------------------------------------|
| 1. summer — hot               | winter      | 2—cold; 0—cool.                      |
| 2. sun — shines               | wind        | 2—blows; 1—howls; 1—chills.          |
| 3. emerald — green            | ruby        | 2—red.                               |
| 4. cats — scratch             | bees        | 2—sting.                             |
| 5. cup — saucer               | knife       | 2—fork; 0—blade.                     |
| 6. light — day                | dark        | 2—night.                             |
| 7. birds — fly                | fish        | 2—swim; 1—swimming.                  |
| 8. write — stories            | draw        | 2—pictures; 1—maps.                  |
| 9. chair — wood               | stove       | 2—iron; 2—steel; 2—metal.            |
| 10. father — son              | mother      | 2—daughter.                          |
| 11. potato — vegetable        | veal        | 2—meat; 1—flesh.                     |
| 12. food — eat                | books       | 2—read; 2—study; 0—learn.            |
| 13. barn — hay                | library     | 2—books.                             |
| 14. clothes — tear            | dishes      | 2—break; 2—crack; 1—smash.           |
| 15. thermometer — temperature | clock       | 2—time.                              |
| 16. water — drink             | air         | 2—breathe; 2—breath; 2—in-<br>hale.  |
| 17. light — dark              | dry         | 2—wet; 1—moist; 1—damp.              |
| 18. July — month              | Friday      | 2—day.                               |
| 19. hair — black              | eyes        | 2—blue; 2—brown; 2—black;<br>2—gray. |
| 20. man — husband             | woman       | 2—wife.                              |
| 21. daily — newspaper         | monthly     | 2—magazine; 2—periodical.            |
| 22. pencil — write            | broom       | 2—sweep; 1—brush.                    |
| 23. lamp — oil                | stove       | 2—coal; 2—wood; 2—gas.               |
| 24. fat — heavy               | thin        | 2—light.                             |
| 25. fast — fastest            | great       | 2—greatest; 0—greater.               |
| 26. factory — workman         | store       | 2—clerk; 1—salesman.                 |
| 27. sparrow — bird            | mosquito    | 2—bug; 2—insect.                     |
| 28. air — birds               | water       | 2—fish; 0—duck.                      |
| 29. water — glass             | coffee      | 2—cup; 0—pot.                        |
| 30. chalk — white             | carbon      | 2—black.                             |
| 31. sight — blind             | hearing     | 2—deaf; 1—deafness; 0—<br>dumb.      |
| 32. ounce — pound             | inch        | 2—foot; 0—yard; 0—feet.              |
| 33. far — near                | there       | 2—here.                              |
| 34. opaque — wood             | transparent | 2—glass; 2—water.                    |
| 35. hat — head                | shoe        | 2—foot; 2—feet.                      |
| 36. after — before            | earlier     | 2—later; 1—late.                     |
| 37. bread — flour             | candy       | 2—sugar; 2—glucose.                  |
| 38. work — problems           | play        | 2—games; 1—ball; 1—dolls.            |
| 39. live — die                | life        | 2—death; 0—dead.                     |
| 40. month — week              | day         | 2—hour; 0—minutes.                   |
| 41. linen — cool              | wool        | 2—warm; 1—hot.                       |
| 42. city — mayor              | state       | 2—governor; 0—president.             |

43. present — known	future	2—unknown.
44. complex — difficult	simple	2—easy.
45. slipper — shoe	cap	2—hat; O—bonnet.
46. mail — write	telephone	2—talk; 2—speak.
47. happy — laugh	sad	2—cry; 2—weep; I—crying; I—sigh; I—moan.
48. cheap — many	costly	2—few; I—rare; I—scarce.
49. picture — frame	field	2—fence.
50. victory — defeat	success	2—failure.

KEY TO ANALOGIES B

1. year — month	week	2—day.
2. work — day	sleep	2—night.
3. vinegar — sour	sugar	2—sweet.
4. eat — food	wear	2—clothes; 2—clothing; 2— garments; I—dress; O— cloth.
5. horn — blow	bell	2—ring; 2—tinkle; 2—toll.
6. rain — summer	snow	2—winter.
7. rose — bush	oak	2—tree.
8. country — road	city	2—street; 2—avenue; O—pave- ment.
9. high — low	near	2—far.
10. iron — heavy	aluminum	2—light.
11. stove — heat	lamp	2—light; I—illuminate.
12. front — back	top	2—bottom.
13. delicious — taste	fragrant	2—smell; 2—odor.
14. Boston — city	Kentucky	2—state.
15. navy — sailors	army	2—soldiers.
16. raise — lower	open	2—shut; 2—close.
17. hard — soft	rough	2—smooth.
18. rug — floor	pictures	2—wall; O—ceiling.
19. box — wood	bottle	2—glass.
20. snow — sleds	ice	2—skates; I—boats.
21. baker — bread	bees	2—honey; I—wax.
22. people — house	birds	2—nest; I—cage; I—tree; I— birdhouse.
23. under — over	down	2—up.
24. triangle — three	square	2—four.
25. number — figures	word	2—letters.
26. sugar — bowl	milk	2—pitcher; I—pail; I—bottle; O—glass; O—cup.
27. foot — leg	hand	2—arm.
28. hair — goat	wool	2—sheep; I—lamb.
29. river — Hudson	mountain	2—(Any mountain.)
30. silver — tarnish	iron	2—rust; 2—corrode; I—oxi- dize.



31. fruit — basket	water	2— <i>pail</i> ; 2— <i>bottle</i> ; 2— <i>pitcher</i> ; 2— <i>jug</i> ; 2— <i>jar</i> ; 2— <i>bucket</i> ; O— <i>glass</i> .
32. foot — ankle	hand	2— <i>wrist</i> .
33. park — play	school	2— <i>work</i> ; 2— <i>study</i> ; 1— <i>learn</i> .
34. wall — paper	floor	2— <i>carpet</i> ; 2— <i>rugs</i> ; 2— <i>paint</i> ; 2— <i>varnish</i> ; 2— <i>oil</i> .
35. sit — sat	fly	2— <i>flew</i> ; 1— <i>flown</i> .
36. grain — wheat	fruit	2—(Any kind of fruit.)
37. man — legs	carriage	2— <i>wheels</i> .
38. violet — odor	red	2— <i>color</i> .
39. coal — black	gold	2— <i>yellow</i> .
40. fire — warms	ice	2— <i>cools</i> ; 1— <i>chills</i> ; 1— <i>freezes</i> ; O— <i>cold</i> .
41. leg — knee	arm	2— <i>elbow</i> .
42. bright — colors	loud	2— <i>sounds</i> ; 2— <i>tones</i> ; 2— <i>noises</i> .
43. kettle — utensil	chair	2— <i>furniture</i> .
44. park — gate	house	2— <i>door</i> .
45. lilac — shrub	fern	2— <i>plant</i> ; O— <i>herb</i> .
46. April — March	Tuesday	2— <i>Monday</i> .
47. fork — tine	knife	2— <i>blade</i> ; O— <i>edge</i> .
48. larva — moth	caterpillar	2— <i>butterfly</i> .
49. house — door	field	2— <i>gate</i> ; O— <i>fence</i> .
50. fair — cloudy	sunshine	2— <i>rain</i> .

## KEY TO ANALOGIES C

1. screw — screwdriver	nail	2— <i>hammer</i> .
2. refrigerator — cold	radiator	2— <i>heat</i> ; 2— <i>warm</i> ; 2— <i>hot</i> .
3. snow — falls	wind	2— <i>blows</i> .
4. December — cold	July	2— <i>hot</i> ; 2— <i>warm</i> .
5. yarn — knit	thread	2— <i>sew</i> .
6. teeth — chew	ears	2— <i>hear</i> .
7. roof — tin	window	2— <i>glass</i> .
8. stove — heat	lamp	2— <i>light</i> .
9. cellar — down	garret	2— <i>up</i> .
10. plate — eat	cup	2— <i>drink</i> .
11. day — week	week	2— <i>month</i> .
12. banana — long	orange	2— <i>round</i> .
13. Longfellow — poet	Edison	2— <i>inventor</i> ; 2— <i>scientist</i> ; O— <i>machinist</i> .
14. flowerbed — flowers	garden	2— <i>vegetables</i> .
15. pen — write	needle	2— <i>sew</i> .
16. farmer — grain	banker	2— <i>money</i> .
17. bed — sleep	chair	2— <i>sit</i> .
18. dog — runs	worm	2— <i>crawls</i> .
19. horse — barn	automobile	2— <i>garage</i> ; O— <i>shed</i> .

20. brush — teeth	comb	2—hair.
21. shoe — lace	coat	2—button.
22. birds — fly	rabbits	2—jump; 2—hop; 1—leap; 1—run.
23. rowboat — oars	canoe	2—paddle.
24. Thursday — Wednesday	April	2—March.
25. house — porch	ship	2—deck.
26. barley — grain	grapes	2—fruit.
27. ink — pen	paint	2—brush.
28. sailor — ship	brakeman	2—train.
29. salad — fruit	omelet	2—eggs.
30. city — village	mansion	2—house; 2—hut; 2—hovel; 2—cottage; 2—cabin.
31. invention — inventor	book	2—author; 2—writer; 1—novelist.
32. thread — spool	ink	2—bottle; 2—well.
33. cow — calf	sheep	2—lamb; 0—ewe; 0—sheep.
34. stockings — shoes	necktie	2—collar; 0—shirt.
35. sugar — sweet	quinine	2—bitter.
36. broker — stock	butcher	2—meat; 1—cuts.
37. yard — length	pound	2—weight.
38. ball — rolls	wheel	2—turns; 2—revolves; 2—rotates.
39. sad — weep	happy	2—laugh; 2—smile.
40. hat — band	shoe	2—lace.
41. engine — engineer	trolleycar	2—motorman; 0—trolleyman; 0—conductor.
42. floor — wood	ceiling	2—plaster; 0—tin.
43. buffalo — herd	wolves	2—pack.
44. farmer — plows	clerk	2—sells.
45. fish — rod	hunt	2—gun; 2—rifle.
46. wood — stain	cloth	2—dye.
47. automobile — motor	wagon	2—horse.
48. grain — food	coal	2—fuel; 0—fire.
49. loud — yell	soft	2—whisper; 0—talk; 0—cry; 0—murmur; 0—speak; 0—sing; 0—sound.
50. ton — pound	pound	2—ounce.

KEY TO ANALOGIES D

1. murderer — kills	thief	2—steals; 2—robs.
2. pencil — write	knife	2—cut; 1—whittle; 1—carve.
3. slide — down	climb	2—up.
4. coffee — hot	water	2—cold; 1—cool.
5. beet — red	butter	2—yellow.
6. apple — fruit	turnip	2—vegetables.

7. bees — honey	cows	2—milk.
8. chair — wood	bottle	2—glass.
9. bell — rings	whistle	2—blows; 2—toots; 0—whistles.
10. forest — trees	village	2—houses; 2—buildings; 2—people.
11. cavalry — ride	infantry	2—walk; 2—march; 0—hike; 0—run.
12. canal — narrow	river	2—wide; 2—broad.
13. cattle — leather	sheep	2—wool.
14. store — merchandise	library	2—books.
15. school — teacher	church	2—minister; 2—pastor; 2—preacher; 2—parson; 2—priest.
16. potatoes — boil	bread	2—bakes.
17. fish — fins	birds	2—wings; 2—wing; 1—feathers.
18. cat — kitten	dog	2—puppy.
19. second — minute	minute	2—hour.
20. butter — cream	cheese	2—milk; 2—whey; 2—curd; 0—cream.
21. London — far	Chicago	2—near.
22. heart — beats	clock	2—ticks; 0—spins; 0—runs; 0—strikes.
23. May — April	Wednesday	2—Tuesday.
24. dog — hair	hen	2—feathers.
25. under — over	below	2—above; 0—up; 0—high; 0—on top.
26. here — there	now	2—then.
27. up — stand	down	2—sit.
28. pen — ink	needle	2—thread.
29. street — city	road	2—country; 0—village; 0—town.
30. wood — warms	ice	2—cools; 2—chills.
31. college — president	school	2—principal; 2—principle; 2—superintendent.
32. mason — stone	carpenter	2—wood.
33. box — wood	satchel	2—leather; 1—rattan.
34. cold — frost	cloudy	2—rain; 1—mist; 1—damp; 0—wet; 0—vapor; 0—fog; 0—dew; 0—hail.
35. shoe — leather	book	2—paper; 1—cloth.
36. stove — coal	lamp	2—oil; 2—kerosene.
37. spend — earn	lend	2—borrow.
38. loud — sound	bright	2—color; 2—light.
39. sculptor — chisel	painter	2—brush; 2—palette and brush.
40. car — seats	room	2—chairs.



41. knife — blade	fork	2— <i>tine</i> ; 2— <i>prong</i> .
42. magazine — wrapper	letter	2— <i>envelope</i> .
43. wagon — wheels	aeroplane	2— <i>wings</i> .
44. blanket — wool	pillow	2— <i>feathers</i> ; 2— <i>down</i> .
45. river — brook	mountain	2— <i>hill</i> .
46. thunder — lightning	wind	2— <i>rain</i> ; 1— <i>storm</i> ; 1— <i>hail</i> .
47. can — top	bottle	2— <i>cork</i> ; 2— <i>stopper</i> ; 0— <i>nose</i> . 0— <i>neck</i> .
48. train — rails	boat	2— <i>water</i> ; 1— <i>river</i> ; 1— <i>sea</i> ; 1— <i>stream</i> ; 1— <i>lake</i> .
49. knife — blade	needle	2— <i>point</i> .
50. bird — wings	horse	2— <i>legs</i> .

KEY TO OPPOSITES TEST A

1. outside	2— <i>inside</i> 1— <i>interior, within</i>
2. near	2— <i>far, distant</i> 0— <i>away</i>
3. black	2— <i>white</i> 0— <i>red, light</i>
4. sick	2— <i>well, healthy</i> 0— <i>fine, recuperated, convalescent</i>
5. friend	2— <i>enemy, foe</i> 0— <i>unfriend</i>
6. open	2— <i>shut, closed</i> 1— <i>close</i> 2— <i>old</i> 1— <i>aged, ancient, antiquated, out-of-date</i> 0— <i>worn, faded, stale</i>
8. dark	2— <i>light</i> 1— <i>bright, white</i> 0— <i>shiny, dawn</i>
9. thick	2— <i>thin</i> 1— <i>sparse, slender, slim</i> 0— <i>few, meagre, small, bright</i>
10. awake	2— <i>asleep</i> 1— <i>sleeping</i> 0— <i>sleep</i>
11. right	2— <i>wrong, left, incorrect</i> 1— <i>erroneous</i> 0— <i>unright, wise, uncertain</i>
12. straight	2— <i>crooked, curly, bent, curved, zig-zag</i> 1— <i>uneven, slant, winding, wavering, dishonest</i>
13. dull	2— <i>sharp, bright</i> 1— <i>brilliant, shiny, radiant, glossy</i> 0— <i>wise, cute, bleak, smooth</i>

- |                |  |
|----------------|--|
| 14. peace      | 2—war, hostility<br>1—fighting, unrest, trouble<br>0—whole, all, quarrel   |
| 15. certain    | 2—uncertain, doubtful<br>1—questionable<br>0—opinion, probable, unlikely   |
| 16. wild       | 2—tame, tamed, civilized, cultivated<br>1—gentle, settled<br>0—timid   |
| 17. stupid     | 2—clever, bright<br>1—wise, smart, brilliant<br>0—unstupid, wicked, quiet, good  |
| 18. artificial | 2—genuine, natural, real<br>1—true, sincere<br>0—solid   |
| 19. sorry      | 2—glad<br>1—happy<br>0—mad, joy, unsorry, cheerful, pleased, cheerfully, satisfied   |
| 20. public     | 2—private<br>1—secret, individual, secluded, enclose, hidden<br>0—social, individualistic, reserved, censored                                |
| 21. sleepy     | 2—awake, wakeful, alert, wide-awake<br>1—keen, refreshed, rested<br>0—tired  |
| 22. double     | 2—single<br>1—one<br>0—singular, half, one-half, alone, solitary   |
| 23. idle       | 2—busy, employed<br>1—working, industrious, active<br>0—work, ambitious  |
| 24. patient    | 2—impatient<br>1—restless, irritable<br>0—unpatient, doctor, sick, nervous, well, quick, hasty, petulant, stubborn, calm, impetuous, fretful |
| 25. similar    | 2—different, unlike, dissimilar<br>1—opposite<br>0—unsimilar, familiar   |
| 26. poor       | 2—rich, wealthy<br>1—fat, fleshy, excellent, stout<br>0—abundant, good   |
| 27. float      | 2—sink<br>1—swim<br>0—sail, drown, struggle, propel  |
| 28. cheap      | 2—expensive, costly, dear<br>1—valuable<br>0—high, exorbitant  |

29. fail  
2—succeed  
1—win, pass, prosper  
0—success, promote, promoted, increase, do
30. innocent  
2—guilty  
1—vicious, culprit, guileful  
0—wise, non-participant
31. sharp  
2—blunt, dull  
1—stupid  
0—unkeen
32. stingy  
2—liberal, generous, lavish  
1—prodigal, unselfish, free, good-hearted  
0—kind, unstingy, giving, wasteful
33. stormy  
2—clear, placid, settled, fair, calm  
1—sunshiny, still, quiet, pleasant, sunny  
0—windy, beautiful, sunshine
34. rude  
2—polite, gentle, courteous, cultured, refined  
1—polished, kind  
0—unrude, good, nice, fine
35. past  
2—present, future  
1—now, coming, here  
0—stayed, remained
36. ignorant  
2—wise, intelligent, learned, educated  
1—bright, brilliant, intellectual  
0—smart, keen
37. hinder  
2—help, assist, aid  
1—encourage, support  
0—initiate, prop
38. blurred  
2—plain, clear, distinct  
1—cleared, clarified  
0—unblurred, bright, brighten, clarify, steady
39. respect  
2—disrespect, despise, contempt, disdain  
1—disregard, dishonor, scorn  
0—unrespect, venerate, belittle
40. native  
2—foreign, foreigner, alien  
1—acquired, newcomer  
0—wild, emigrant
41. vanish  
2—appear  
1—reappear  
0—come, here, present, stay, stayed, remain, apparent, evident, continue, retain
42. broken  
2—whole, unbroken, mended  
1—straight, repaired, intact  
0—together, unite, fixed
43. lazy  
2—industrious, energetic, hard-working  
1—ambitious, busy, active  
0—ambition, unlazy, quick, bright, willful, speedy, sleepy, willing, wise, helpful, lively, spry, smart, eager, alert



44. modern  
2—ancient, antique, antiquated, old-fashioned, old  
1—past  
0—unmodern
45. feed  
2—starve  
1—deprive, disgorge  
0—hungry, hunger, famished, weaken
46. raw  
2—cooked  
1—well-done  
0—ripe, sweet, smooth, tender, soft, cultured, boiled
47. slope  
2—level, flat  
1—prairie  
0—straight, even, evenly, hill, elevation, abrupt, steep
48. fatigued  
2—rested  
1—fresh, alert, vigorous  
0—comfortable, rest, keen, energetic, ambitious
49. unite  
2—separate, divide, disband  
1—disunite, sever, scatter, disconnect  
0—apart, together, ununited, open, cut
50. permanent  
2—temporary, shifting, transient, transitory  
1—movable, unstable, vacillating  
0—uncertain, short

## KEY TO OPPOSITES TEST B

1. early  
2—late  
1—tardy
2. slow  
2—fast, quick, rapid  
1—lively, hurried
3. dirty  
2—clean, immaculate, unsoiled  
1—fresh  
0—washed
4. crooked  
2—straight, vertical, horizontal  
0—perpendicular, bent, curled
5. empty  
2—full  
1—filled
6. heavy  
2—light  
0—thin, bright, active, keen, small
7. dry  
2—wet  
1—moist, rainy  
0—showery, misty
8. quiet  
2—noisy  
1—loud, talkative, boisterous  
0—noise
9. many  
2—few  
0—small, little, none, one, couple, several
10. enemy  
2—friend  
1—ally  
0—army, angel, Hun

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|---------------|--|
| 11. peace     | 2—war, hostility<br>1—fighting, unrest, trouble<br>0—whole, all, quarrel   |
| 12. happy     | 2—sorry, sad, unhappy<br>1—angry, sorrow, mad<br>0—sorrowful, discontented   |
| 13. tall      | 2—short<br>1—stubby<br>0—small, little, runt   |
| 14. sunny     | 2—cloudy, shady<br>1—gloomy, rainy, shaded<br>0—rain, dark, dull   |
| 15. spend     | 2—save, earn, hoard<br>1—keep, receive, conserve<br>0—saved, safe, bank  |
| 16. few       | 2—many<br>0—couple, lot, one, several, much, quantity, no  |
| 17. rough     | 2—smooth, even<br>1—gentle, kind, polished<br>0—soft   |
| 18. distant   | 2—near, nearby<br>1—close<br>0—nearness, present, here   |
| 19. stout     | 2—slender, thin, slim, lean<br>1—weak, skinny, slimy<br>0—unstout, tall  |
| 20. necessary | 2—unnecessary, useless, unessential, needless<br>0—superficial   |
| 21. moist     | 2—dry<br>1—arid<br>0—wet, powdery  |
| 22. drowsy    | 2—awake, wide-awake<br>1—alert, animated, bright, wakeful, energetic, vivacious<br>0—lively, vigorous, boisterous, keen, brilliant |
| 23. careless  | 2—careful, cautious, watchful<br>1—neat, trim, tidy, well-groomed<br>0—care, kind, immaculate, suspicious                          |
| 24. end       | 2—begin, beginning<br>1—continue, first, start, commencement<br>0—middle, side, front, fore, means                                 |
| 25. cloudy    | 2—clear<br>1—fair, bright, sunny<br>0—uncloudy, shiny, sunshine, light   |
| 26. latest    | 2—earliest<br>1—oldest<br>0—youngest, farthest   |

27. single                    2—double  
                                  1—together, married, span, couple, pair  
                                  0—plural
28. push                    2—pull, draw  
                                  1—haul
29. together                2—apart, separately  
                                  1—alone, separate, scattered  
                                  0—single, away, scatter
30. wise                    2—foolish, unwise  
                                  1—stupid, ignorant, simple  
                                  0—dumb, slow, dull, unwisely
31. numerous              2—few, scarce  
                                  1—scanty, sparse  
                                  0—unnumerous, scarcity
32. strength                2—weakness  
                                  1—inability, incapacity  
                                  0—weak
33. joy                      2—sorrow, sadness  
                                  1—unhappiness, misery  
                                  0—sad, happy, sorry, angry, unhappy, sober
34. gentle                   2—rough, harsh, brutal  
                                  1—cruel, mean, hard, rude, ferocious  
                                  0—ungentle, savage, uncivilized, wild, inconsiderate
35. sturdy                   2—weak  
                                  1—anaemic, sickly  
                                  0—unsturdy, limber, pale, colorless, lifeless, pallid, vacillating, wan
36. safe                     2—unsafe, dangerous  
                                  0—danger, doubtful, uncertain
37. kneel                    2—stand  
                                  1—arise  
                                  0—lay, erect
38. most                    2—least, fewest  
                                  0—less, little, few, none, smallest
39. help                    2—hinder, prevent, interfere  
                                  1—resist, oppose, injure, hindrance  
                                  0—hurt
40. massive                2—small  
                                  1—little, insignificant, tiny, slender, miniature, unimposing  
                                  0—few
41. memorize                2—forget  
                                  1—unlearn  
                                  0—learn, lose, shirk, recall, remember
42. prolong                2—shorten, diminish, decrease  
                                  1—lessen, stop





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|---------------|---|
| 10. dislike   | 2—like<br>1—love<br>0—approve, want   |
| 11. spend     | 2—save, keep, hoard<br>1—bank, get, acquire<br>0—saved, unspend, receive                                |
| 12. after     | 2—before, previous, preceding<br>1—ahead<br>0—following   |
| 13. soft      | 2—hard<br>1—loud<br>0—smooth, rough   |
| 14. dead      | 2—alive<br>1—live<br>0—life, quick  |
| 15. remember  | 2—forget<br>0—recall, learn, grasp  |
| 16. weak      | 2—strong<br>1—robust<br>0—healthy, stout, good, well  |
| 17. upper     | 2—lower<br>0—down, beneath, downward, below, under  |
| 18. always    | 2—never<br>1—seldom, sometimes<br>0—occasionally  |
| 19. sorry     | 2—glad<br>1—happy<br>0—mad, joy, unsorry, cheerful, pleased, cheerfully, satisfied                      |
| 20. necessary | 2—unnecessary, useless, unessential, needless<br>0—superficial  |
| 21. lengthen  | 2—shorten<br>1—contract, decrease<br>0—short, fold, discontinue   |
| 22. increase  | 2—decrease, lessen, diminish, wane<br>1—deteriorate<br>0—smaller  |
| 23. true      | 2—false, untrue<br>1—fraudulent<br>0—lie, liar, guilty, dishonest                                       |
| 24. silent    | 2—talkative, noisy<br>0—noise, disorderly, loud, loudly, talking  |
| 25. retail    | 2—wholesale   |
| 26. foolish   | 2—sensible, wise<br>1—bright, clever, reasonable, rational, sane<br>0—smart, nice, unfoolish, brilliant |

27. even  
2—uneven, odd  
1—irregular  
0—rough, crooked, rugged, quick, hasty
28. earn  
2—spend  
0—loan, save, borrow, steal, stolen, spent, charge, sponge
29. regular  
2—irregular  
0—unregular, uneven, tardy, insurgent
30. continue  
2—stop, quit, cease, discontinue  
1—end, finish, conclude, pause  
0—uncontinued, recontinue
31. left  
2—right, remained  
1—stayed  
0—took, borrow, has, gone, came
32. heathen  
2—Christian  
1—civilized, believer  
0—native
33. deceitful  
2—honest, truthful, trustworthy, frank, above-board  
1—true, reliable, open  
0—rightful
34. punctual  
2—late, tardy  
1—behindhand  
0—slack, remiss, thoughtless
35. leave  
2—stay, take, arrive  
1—come  
0—took, go, bring, fetch
36. ugly  
2—pretty, beautiful  
1—handsome, good-looking, lovely  
0—good, nice, pleasant, happy, glad, kind, gentle, sweet  
friendly, cheerful
37. superior  
2—inferior, subordinate  
1—common, lower, beneath  
0—unsuperior, usual, under, below
38. often  
2—seldom, rarely  
1—never, sometimes  
0—unfrequent, unfrequently
39. plentiful  
2—scarce, scanty  
1—sparse, rare, scarcity, few  
0—shortage, famine, frugal, need, needy, lack
40. busy  
2—idle, inactive, indolent, loafing  
1—lazy, unoccupied  
0—slow, quiet, loaf
41. suitable  
2—unsuitable  
1—unsuited, faulty, improper, clashing, unbecoming  
0—inharmonious, jarring, misfit, misfitting
42. survive  
die, perish  
1—sink, starve  
0—unsurvive, yield, surrender



43. reveal  
2—hide, conceal  
1—cover, secret, secreted  
0—disclose
44. part  
2—all, whole, join, unite  
0—close
45. timid  
2—bold, aggressive  
1—forward, brave  
0—strong, vigorous, boisterous, rash, frank, open, fool-hardy, impetuous
46. civil  
2—uncivil  
1—military  
0—wild, criminal, foreign, private, professional
47. faulty  
2—faultless, perfect, correct  
1—right, blameless  
0—whole, intact
48. economical  
2—uneconomical, wasteful, extravagant, prodigal  
1—lavish, spendthrift  
0—wasting, waste, unsaving, extravagance  
1—true, actual, practical
49. imaginary  
2—real  
0—unimaginary, plain, clear-minded
50. follow  
2—lead  
1—stay, remain, precede  
0—leave, stop, retreat, initiate

### KEY TO OPPOSITES TEST D

1. late  
2—early  
1—timely, beforehand, punctual  
0—punctually
2. fast  
2—slow  
0—run
3. wrong  
2—right, correct  
1—perfect
4. narrow  
2—wide, broad  
0—straight
5. rich  
2—poor  
0—thin
6. alive  
2—dead  
0—asleep, died, dormant, petrified, conservative
7. thin  
2—fat, thick  
1—fleshy, plump, stout  
0—dense, heavy
8. sad  
2—happy, glad  
1—cheerful, joyful, merry, joyous, jubilant  
0—joy
9. many  
2—few  
0—small, little, none, one, couple, several



25. cruel  
 2—kind, tender  
 1—loving, gentle, sympathetic  
 0—uncruel, good, nice, kindness, mild, fondling
26. generous  
 2—stingy, selfish, miserly, parsimonious  
 1—greedy, niggardly  
 0—mean, hard, ungenerous, ugly, niggard, meager, thrifty, uncharitable
27. famine  
 2—plenty, abundance, feast  
 1—harvest  
 0—bountiful, food, alleviation
28. take  
 2—leave, give  
 1—release  
 0—permit, allow, send
29. never  
 2—always  
 1—sometime, ever, forever  
 0—new, again, frequent, seldom
30. silence  
 2—noise, commotion  
 1—loudness, speech, sound, talkativeness  
 0—noisy, laughter, crying, taciturnity
31. hostile  
 2—friendly  
 1—kind, helpful  
 0—unhostile, liking
32. inferior  
 2—superior  
 1—better, higher  
 0—above, upper
33. remote  
 2—near, close, neighboring, nearby  
 1—recent, adjoining, present  
 0—unremote, proximity, here, probable, likely
34. doubtful  
 2—certain, sure, positive, unquestionable  
 1—true  
 0—believe, undoubtful, certainty, candid, trustworthy, undoubted
35. level  
 2—rough, hilly, uneven, undulating, irregular  
 1—slope, slanting, slant, rugged, rocky  
 0—unsmooth, unlevel, crooked
36. succeed  
 2—fail  
 1—unsuccessful, defeat, precede  
 0—unsucceed, yield
37. humble  
 2—proud, haughty, arrogant, exalted  
 0—unhumble, rich, dignity, dignified, bold, valiant, aggressive, aristocratic
38. break  
 2—mend, repair  
 1—patch, heal, unite, connect, combine, fix  
 0—bend, whole
39. pleasant  
 2—unpleasant, disagreeable  
 0—rude, sad, miserable, horrid, mean, sorry, sullen, mad, ugly, grouchy, unkind, spiteful





# A Study of Twenty High School Seniors of Superior Intelligence

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*Purpose and Method of This Study.* The aim of this investigation was to study a group of high school seniors of superior intelligence. Various questions suggested themselves, viz.: (1) What kind of homes do these young persons come from? (2) Are their parents or other relatives superior in any respect? (3) Are the young people themselves superior as to health, or were they precocious in physical development? (4) What evidences are there of mental precocity or unusual ability? (5) In what other respects do these superior boys and girls differ mentally from their fellows? It was possible to deal with the first four questions with some degree of thoroughness, but the last called for far too elaborate treatment. However, the matter of interests, especially vocational interests, received some attention.

The Otis group tests (Oakland edition), which are similar to the tests of general intelligence used in our army during the Great War, were given to the five hundred and forty-three high school seniors of Oakland, California, in March, 1919.<sup>1</sup> The twenty pupils who scored highest, *i. e.*, less than 4 per cent, were selected for study. For comparison, another group of twenty, whose test scores lay at, or next to, the median score, was chosen. The next step was to make copies of all school records concerning each of the forty. Besides this, as many teachers as possible were asked to give their estimates of each pupil's intelligence and to add any other information they could. Then visits were made to the homes of the twenty superior young persons, where the writer obtained information as to the education, occupation, and achievements of parents and grandparents, the young person's physical development and health, early education, mental development, interests, duties, character, special abilities, and finally, home surroundings, brothers and sisters, special

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<sup>1</sup>The writer is indebted to Dr. Virgil E. Dickson, Director of the Oakland Department of Research, for his assistance and advice. Thanks are also due to Professor Warner Brown of the University of California for direction and criticism of this study.

influences, etc. In every case the parents answered most willingly. It should be added that they were almost always reluctant to stress their own children's superiority. The tendency seemed to be to underestimate their ability rather than the reverse. Lastly, a questionnaire dealing primarily with interests was filled out by the forty young persons. This they did in small groups, generally three or four at a time, in the presence of the writer. In some cases she had friendly talks with the pupils in their own homes, but usually the times devoted to the questionnaire furnished the only opportunity for talking with them. They seemed friendly, interested, and anxious to answer the questions carefully.

It must be remembered that one group test does not provide a completely satisfactory way of rating intelligence. Possibly a good many pupils did not do themselves justice. Moreover, we should not claim too much for the tests themselves. Doubtless they fail to give evidence of numerous phases of intellectual superiority. However, the superior pupils selected certainly rank high in the mental abilities that the tests measure.

*The Nature of the Two Groups Selected.* It is apparent from Table I that the mental-test ratings of the superior group range from 165 (out of a possible 172 points) to 149. The median for all the seniors was 118. Eight had precisely this score. To complete what is here called "the median group," twelve pupils whose ratings lay at 117 or 119 were chosen in the chance order in which their names were recorded, rejecting, however, two foreign-born pupils who did not speak English fluently.

Table I shows that there are fourteen boys and only six girls in the superior group. Furthermore, the girls are noticeably below the boys in their standing.<sup>2</sup> There is only one girl among the seven students at or above 160, and the rest of the girls fall below 156. Just what this sex difference indicates is not clear. Does it point to the inferiority of the female sex in "general intelligence"? Does it support the theory of greater male variability? Or is it that the Otis tests are better adapted to masculine intellect, training, or temperament. Or are there other factors at work,

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<sup>2</sup>Cf. L. M. TERMAN, *The Intelligence of School Children*, N. Y., 1919, pp. 171-172, for somewhat similar findings. The writer has had many suggestions as to the general method of this study from the work of Terman and Margaret Hopwood Hubbard.



TABLE I. SUPERIOR GROUP

Person's Number	Boy or Girl	Mental-Test Rating	Average of High School Marks	Teachers' Estimate of Intelligence	Course	Age at Graduation from High School	
1	B	165	2+	1	College Preparatory	17 yrs.	10 mos.
2	B	162	1—	1	" "	16 "	10 "
3	B	161	1—	1	" "	16 "	2 "
4	B	160	2	1	" "	19 "	10 "
5	G	160	2+	1	" "	17 "	9 "
6	B	160	1—	1	" "	17 "	7 "
7	B	160	2+	1	" "	17 "	2 "
8	B	158	3+	3	" "	18 "	1 "
9	B	157	2+	2	" "	17 "	7 "
10	G	156	2+	1	" "	17 "	4 "
11	B	155	2+	2	General	16 "	0 "
12	B	155	2—	1	College Preparatory	16 "	11 "
13	G	154	1—	1	" "	15 "	11 "
14	G	153	2+	2	General	16 "	5 "
15	B	152	2+	1	College Preparatory	17 "	9 "
16	B	151	3	3	General	19 "	2 "
17	B	151	3	3	College Preparatory	17 "	11 "
18	B	151	2	2	" "	17 "	5 "
19	G	150	1—	1	" "	16 "	6 "
20	G	149	3—	2	" "	16 "	5 "

TABLE II. MEDIAN GROUP

Person's Number	Boy or Girl*	Average of High School Marks*	Course	Age at Graduation from High School	
21	B	2+	College Preparatory	17 yrs.	8 mos.
22	B	2+	" "	19 "	2 "
23	B	2	" "	17 "	10 "
24	B	2	" "	17 "	10 "
25	B	3+	" "	19 "	4 "
26	B	3+	General	20 "	0 "
27	B	3+	Commercial	18 "	4 "
28	B	3	College Preparatory	18 "	5 "
29	B	3	General	18 "	3 "
30	B	3	" "	18 "	2 "
31	B	3—	" "	20 "	1 "
32	B	3—	College Preparatory	19 "	3 "
33	G	1	College Preparatory	17 "	2 "
34	G	2+	" "	17 "	2 "
35	G	2+	General	17 "	4 "
36	G	2	" "	18 "	0 "
37	G	2	Commercial	18 "	4 "
38	G	2	College Preparatory	16 "	8 "
39	G	2—	" "	17 "	8 "
40	G	3+	General	18 "	2 "

\*Since the mental-test ratings are practically the same for all (117-119), boys and girls have been grouped separately, beginning with those who have the highest school marks.

That the boys excel the girls in the mental tests was also apparent for the senior class as a whole, the median for the girls being 114, for the boys 122. It has been suggested to the writer that the senior boys as a whole might have been superior mentally to the girls, for both inclination and the necessity of going to work would tend to eliminate boys of mediocre intelligence. There were only two-thirds as many senior boys as senior girls. The explanation suggested might well account in part for the boys' superiority. But the writer believes that the chief reason lies in the fact that girls are undoubtedly at a disadvantage in the tests. They suffer from nervousness to a far greater degree than do boys. Their desire to excel becomes "fluster" rather than fruitful effort.

*Scholarship and Teachers' Estimates.* Comparisons were made of the high school marks with the mental-test ratings and also with the teachers' estimates of intelligence. The school records were not entirely uniform, generally because of the pupil's transfer from another city, but it was possible to accord to each young person an average grade, which, it is believed, is trustworthy. The grades 1 (excellent), 2 (thoroughly satisfactory), 3 (passed), 4 (failed conditionally), and 5 (complete failure) are used in the Oakland schools. For the sake of finer discriminations plus and minus signs are added in this study.

As many teachers as possible were asked to estimate each superior pupil's intelligence. It was made clear that intelligence, not simply achievement in studies, was to be judged. 1 is taken to mean "very superior"; 2, "superior"; 3, "average"; 4, "inferior"; and 5, "very inferior." Such estimates for the median group were not completed.

It will be seen from Tables I and II that fifteen, or 75 per cent, of the superior group have scholarship records at or above 2, while only 10, or 50 per cent, of the median group are similarly graded. Furthermore, seventeen of the superior pupils took the college preparatory course, which is considered more difficult than other courses; but of the others only eleven took this harder course. It would seem, then, that the superior group tend to do better in school than the median group, though this by no means always follows. The boys of the median group generally range around 3 and never get as high as 1—; but the median girls usually do 2 or 2+ work, one of them even making the highest record (all 1's) of all forty. The

girls of the superior group also generally surpass the boys of that group in school work. As regards estimates of intelligence different teachers did not always agree, but the writer has tried to give representative figures. These (see Table I) are in considerably closer agreement with the Otis-test ratings than are the school marks.

*Home Conditions.* The home conditions of the superior group were unusually satisfactory. There were no extremes of wealth or poverty, but good, comfortable homes, where the parents were sensible and kindly. The relationship between parent and child, what in the Whittier Scale<sup>3</sup> is called "parental supervision," was found to be particularly good. Four of the twenty were broken homes, but excellently controlled by intelligent mothers. Two of these were widows. The two others had left their husbands when the sons in question were six and eight years of age respectively.

The young person's place for home study was always noted. In every case but one (number 16, not a good student and rated low by his teachers) this was found adequate. Number 7, a remarkably bright boy, did practically no home studying.

*Relatives.* All the pupils of both groups were born in the United States. It must be remembered, however, that two foreign-born pupils were rejected from the median group because of their ignorance of English. In the superior group, ten, or 50 per cent, were born in California; in the median group, fifteen, or 75 per cent.

The nativity of parents was as follows:

		Fathers	Mothers	Both Parents
Superior .....	{ Native-born .....	18	19	18
	{ Foreign-born .....	2	1	1
Median .....	{ Native-born .....	14	17	14
	{ Foreign-born .....	6	8	3

The superior young people, then, were distinctly "American" as to parentage, and somewhat more so than the students whose test rat-

<sup>3</sup>WILLIAMS, J. HAROLD. *The Whittier Scale for Grading Home Conditions*. Journal of Delinquency, Vol. I, 1916, pp. 273-286.



ings fell at the median. Information as to grandparents is slightly incomplete, because in the case of the median group it was obtained solely from the questionnaire, unverified by the parents. Roughly speaking, for the superior group about 60 per cent of the grandparents were native-born, and for the median group about 45 per cent. For both groups, but more particularly the superior, there was a strong preponderance of Anglo-Saxon stock.

An attempt was made to classify the occupations of parents and grandparents according to Taussig's scale, which has five gradations ranging from the well-to-do, or professional, class to that of day-laborers. Judging social status on this basis, the superior group seemed to rank somewhat higher.

The numbers in the following table show how many parents of the superior pupils completed, or nearly completed, the school course indicated:

Type of Education	Fathers	Mothers	Total	Both Parents
Post Graduate .....	1	0	1	0
College .....	5	2	7	2
Normal School .....	0	2	2	0
High School .....	8	5	13	4
"Self-Educated" <sup>1</sup> .....	4	0	4	0
Grammar School .....	7	6	13	6

<sup>1</sup>"Self-educated" means with grammar school education supplemented by later study.

Twenty-three, or over one-half, of the parents of the superior boys and girls had a high school or college education. No figures can be given for the median group.

Four of the superior pupils were the only children in their families. In only three of the sixteen remaining families did the mother consider the child in question mentally superior to her other children. In two instances the writer had access to independent data, and these supported the mother's verdict—in the one case, that the child was superior, and in the other, equal in intelligence to the brothers and sisters.

*Health and Physical Development.* According to their parents, twelve of the superior group were strong in infancy, three had only fair health, and five were sickly babies. In only a few cases had the parents kept records of the child's development, so their statements

on many points may well be inaccurate. There is little evidence of precocity in getting the first teeth. However, the young people seem, on the whole, to have been precocious in walking and talking. In respect to walking, Mead's statistical study<sup>4</sup> compares as follows:

	Range	Median	Average
Mead: 50 normal children* .....	11-30 mos.	13.54 mos.	14 mos.
This study: 20 superior children .....	9-19 mos.	12 mos.	12.2 mos.

\*Since Mead's normal group comprises children of graduate students and a few professors, it is probably rather above average in intelligence.

Since the term "to walk" has been defined more strictly in this investigation than in Mead's, the above figures represent a conservative estimate. An average of the estimated times when the superior children could first use words in short sentences was found to be about nineteen months. Two years is given by most authorities as the usual average.<sup>5</sup>

The list of illnesses, injuries, etc., of the superior boys and girls indicates that they have had their share. However, twelve, or 60 per cent, were judged by their mothers "very superior" to the average, in general health, and only two, or 10 per cent, below average (though not seriously so). One of the latter (number 2) had twice undergone operations (appendicitis and stricture) and was subject to colds besides," and the other (number 18) was a somewhat delicate boy who suffered from various minor ailments. Except that seven of the group wore glasses, none had any physical defects or deformities. None had ever had any neurotic symptoms, though six were "high-strung," or of a "nervous temperament."<sup>6</sup>

If we accept fourteen to sixteen as the usual age of puberty for boys, the group shows some precocity. We find a range from 12 to 17, with an average of 13.7, and a median and mode at 14. It is useless to consider only six girls, though a tendency to early physiological maturity also shows with them.

<sup>4</sup>MEAD, C. D. *The Relations of General Intelligence to Certain Mental and Physical Traits*. Teachers' College, Columbia, Contributions to Education, No. 76, 1916.

<sup>5</sup>HOLT, EMMETT. *Care and Feeding of Children*. N. Y., 1915, p. 35.

<sup>6</sup>Cf. L. M. TERMAN, *The Intelligence of School Children*, Chapter X, for comparable data in this and the next section. Though Terman's subjects were selected from a greater number and were consequently of a higher mental level, it should be noted that his findings at parallel points are closely similar.

*Education and Mental Development.* In all, four, or one-fifth, of the superior pupils went to kindergarten. Only six, or 30 per cent, ever had any formal home teaching. This varied from merely being taught the alphabet (number 12) to regular instruction in spelling, reading, and number work (numbers 13, 18, 19). Table III shows that thirteen of the twenty had learned to read before they went to school. With twelve of them reading was almost wholly a self-initiated and self-conducted process, they "just picked up reading," or "insisted upon being told what the letters and words meant," etc.

After beginning school thirteen children were regular in attending. Table III briefly indicates the attendance record of the remain-

TABLE III. SUPERIOR GROUP

Person's Number	Age of Learning to Read. (Age at last Birthday)	Age at Entering School. (Age at nearest Birthday)	Grade Entered First	Regular in School Attendance?	Number of Whole-Year Grades Skipped (Including High School Grades) After Entering School
1	6 Years	7 Years	Grade I	Yes	1
2	5 "	5 "	" "	Fairly (ill-health)	2
3	3 "	6 "	" "	Yes	2
4	5 "	6 "	" II*	Yes, but out 2 years (at work from choice)	0
5	At School	6 "	" I	Yes	0
6	5 Years	6 "	" "	Yes	0
7	5 "	6 "	" "	Yes, but out 2 yrs. (at work from choice)	3
8	6 "	7 "	" "	Yes	1½
9	4 "	6 "	" "	Yes (after 9th year)	1
10	At School	6 "	" "	Yes	1
11	" "	6 "	" "	Yes	2
12	" "	6 "	" "	Yes	1
13	4 Years	8 "	" V	Yes	0
14	At School	6 "	" I	Yes	1½
15	" "	7 "	" "	Yes, but out nearly yr. (illness)	1
16	" "	7 "	" "	Yes	0
17	5 Years	7 "	" "	Yes, but out 1 yr. (serious accident)	2
18	5 "	8 "	" III	No (ill-health)	½
19	5 "	7½ "	" III†	Yes	½
20	4 "	6 "	" I	Yes	2

\*This six-year-old went into the second grade at once, though his only previous means of learning had been by listening to his older sister being taught.

†Upper



ing seven. Fifteen, or 75 per cent, skipped from one-half to three whole-year grades (including those of the high school) after entering school; and these figures would be even higher if five of the mothers had not discouraged more rapid progress. Many of the boys and girls took unusually hard high school courses. We have already noted scholarship records in high school (Table I). It is estimated from the parents' judgments and the few available records that sixteen, or 80 per cent, of the group had excellent school marks in the grades previous, and that the four boys who did not acquit themselves so well achieved thoroughly satisfactory marks, nevertheless. Let us compare the ages at graduation from high school of the superior and median groups:<sup>7</sup>

	Range	Median	Average
Superior Group .....	15.9-19.8 yrs.	17.5 yrs.	17.3 yrs.
Median Group .....	16.7-20.1 yrs.	18.2 yrs.	18.3 yrs.

It is clear that the superior pupils were, on the whole, younger than those with a mental rating at the median.

Investigation of each case convinced the writer that there was ample evidence in addition to the tests that at least eighteen of the superior group were distinctly above the average in general intelligence. The other two seemed not remarkable, though there was evidence of their mental alertness. In every case mental ability was found to be general, or "all-round." However, nearly all had some special talent, or talents, such as musical, artistic, literary, or dramatic ability, though none had shown extraordinary gifts.

*Interests and Vocational Aims.* Space permits only the following more important indications from the questionnaire:

(1) The superior pupils, as a group, did not find their studies easier nor more interesting than did the median group. To a slight extent the reverse was true. Probably this was due to the fact that the college preparatory course, elected by seventeen of the former as against eleven of the latter, offered fewer electives and required subjects that made less popular appeal.

<sup>7</sup>See Tables I and II.

(2) In quality the extra-curricular reading of the two groups was much the same. However, difference lay in amount, the average number of hours a week for the superior pupils being 8.9; for those of the median group, only 5.1.

(3) The range of "hobbies," or interests, was somewhat greater for the superior young people, both individually and collectively, than for the pupils at the median. The superior group was more interested than the median in activities requiring brain rather than brawn.

(4) In qualities of leadership and organization, and in ability to construct and create, the more intelligent group showed some superiority to the median.

(5) As regards employment (both paid "jobs" and home duties) of the boys, it was found: (a) That employment outside the home had been of much the same nature for both groups. "Paper boy," "delivery boy," "office boy," "ranch hand," "theater usher," "factory helper," "cannery worker," "chauffeur," and "clerk" were typical terms used. (b) But that the superior group had given a little less than half as much time as the median group to outside employment. Since the average number of hours of work a day during times of employment was much the same for both groups, the total amount of employment in years can be compared in the following table:<sup>8</sup>

	Range	Median	Average
Superior Group .....	5 yrs.-0	1 yr.	1.4 yrs.
Median Group .....	8 yrs.-4 mos.	2 yrs.	3. yrs.

(c) That home duties took the time of both groups about equally.

(6) Regarding employment and home duties of the girls it was discovered: (a) That the amount of paid employment outside the home was insignificant; and that the superior girls had had even less than the girls at the median. (b) The two superior girls ( $33\frac{1}{3}$  per cent) who had been employed, listed caring for children and "selling electric lamps"; the four median girls (50 per cent) named "clerking" in stores, working in a cafeteria, and working in a fruit cannery. (c) All of the superior group and 62 per cent of the median group had regular home duties.

<sup>8</sup>To get these figures the durations of all the "jobs" of each boy were added.

(7) For neither group, taking into account both boys and girls, was there any clear correlation between past employments and future vocational aims.

(8) The two groups of boys had very similar vocational aims; and the same may be said of the girls. For the former, engineering, chemistry, and law, in the order named, were the most popular fields. The girls expressed a preference for careers as writers and musicians, though commercial work (including stenography), teaching, the stage, and other lines were mentioned.

*Conclusions.* It should be noted that this paper gives only a very brief summary of some of the facts brought out by the investigation. While no definite conclusions can be drawn with only twenty subjects, this study tends to show that:

1. Mentally superior high school pupils come from homes where conditions are favorable to right development.
2. They are generally precocious physically as well as mentally.
3. They are not below the average in general health.
4. They have less paid employment outside the home than their fellows, and spend more time in reading.
5. They have more intellectual interests, and seem to be somewhat better leaders and organizers than average young people.
6. Pupils of superior and average intelligence have very similar vocational aims.

This study cannot be compared with others of exceptionally intelligent high school pupils, for, as far as the writer knows, there are none that have attempted to get so wide a range of data. There seems to be, however, a growing interest in the "bright" child. We realize that the world needs men with brains. Detailed investigations of the mentality and development of our superior young people will lead, it is hoped, to more adequate educational provisions for them.



## A Test of Some Standard Tests

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A SURVEY of the work of a very modern type of Rhode Island school was made by the writer in 1919. This investigation was based upon the following standard tests of intelligence and efficiency: Trabue language completion, scale alpha; Thorndike's scale alpha for the understanding of sentences, Thorndike's opposites, Whipple's word-building, Thorndike's visual vocabulary, Courtis arithmetic, Series B, Form A, Kansas silent reading, quality and rate of handwriting scored by the Ayres Gettysburg scale, Ayres spelling in sentences and Ayres spelling in columns—in all thirteen tests; the opposites and word-building being primarily intelligence tests, the others, tests of school ability or efficiency. The original aim of the work was to furnish records for the school which might serve as a relatively thorough diagnosis of each individual and grade, from the point of view of standard scores, so that on the basis of these data, remedial measures might be applied where necessary. The testing of the children suggested as a by-product the opportunity of testing the tests employed, in so far as the scope of the situation permitted.

Of the two hundred pupils examined, none below the fourth grade are included in this account, and only sixty above the third grade were present at all the tests. This reduction in attendance was occasioned by the epidemic of influenza then prevalent. The scores of the sixty mentioned, therefore, furnish the data for the greater part of the investigation. The distribution of these pupils in the different grades was as follows: thirteen in the eighth, eleven in the seventh, twelve in the sixth, fourteen in the fifth, and ten in the fourth. Except in the case of a few individuals, the results of giving standard tests below the fourth grade were unreliable. Comprehension of the language of both the tests themselves and the directions for administering them, the naturally vagrant attention of young children when confronted with abstract material, and the tendency to guess the answers were stumbling blocks to consistent reactions. Performance tests, constructive and interpretive in character are needed for such work in primary grades.

In order that comparison might be made regardless of school grade, each child's score in each test was reduced to a decimal by dividing his individual score by the standard median score of his grade. If a child's score happened to be exactly the standard score, his mark was, like the Terman intelligence quotient, 100. If he received 6 where the standard was 8, the mark recorded was 75. If he obtained 9 where the standard was 6, his mark was 150. Each pupil's scores for the entire number of tests were then averaged. These general-ability-quotients based upon the results of the tests arranged in order of merit regardless of the school grade in which the pupil might be classified. For convenience of inspection this uniformity of procedure was especially advantageous, because of the widely varying score values of the different tests. For example, in Thorndike's visual vocabulary the possible scores range, approximately by units, from 4 to 11, in the Kansas silent reading by fractional steps from 2 to a total of 46, for grades 6, 7, and 8. For part 2 of Thorndike's understanding of sentences, 7 to 9, and so on. The standard scores of the different tests for any given grade, therefore, are not numerically similar. In each case, to determine the relation of a child's score to the standard requires the delay of comparison of his mark with the standard. For this reason the ability-quotients were found convenient.

Comparison with a year's actual school grades resulted in a correlation of .94 between school grades and average scores in the tests given. Teachers' estimates of the pupil's general ability also agreed almost invariably with the order of merit determined by the tests. This group of tests, therefore, furnished a relatively reliable gauge of general intelligence, if by intelligence we mean potential ability to learn, and by learning we mean the modification of behavior through experience.

The scores of the pupils of the entire school including the above-mentioned group of sixty were also averaged, in each case taking into account an individual's scores for all the tests at which he was present. (The number of the tests taken by individuals varied from three to thirteen.) The range of these averages of the large group was 59 to 150, the latter score being included in the small group, whose lowest average score was 75. The median score of the large group was 100, of the small group 96, with quartile deviations of

3.3 and 1.1 respectively, indicating that the entire school had attained relatively standard excellence, and that the small group was somewhat more compact and selected than the large group. Evidently differences in achievement in the small group had been smoothed out, as the quartile deviation includes roughly half of the measures.

TABLE I

*Results of Testing Sixty Pupils—Grades 4 to 8 Inclusive*

Tests	Range* of Ability	Median Ability	Correlation with Average of all Tests
Ayres Spelling—sentences .....	7-139	93	.29
Ayres Spelling—columns .....	10-171	115	.26
Kansas Silent Reading .....	44-236	116	.42
Handwriting—quality .....	52-175	102	.02
Handwriting—rate .....	25-175	104	.41
Courtis Arithmetic—accuracy ....	24-148	82	.52
Courtis Arithmetic—rate .....	75-150	100	.57
Kansas Silent Reading—rate .....	80-140	85	.52
Thorndike Reading—sentences ..	0-167	92	.26
Trabue Completion—alpha .....	64-225	110	.43
Visual Vocabulary—Thorndike ..	75-291	120	.62
Opposites—Thorndike .....	11-240	114	.57
Word Building—Whipple .....	33-280	135	.65

\*Range extends above and below 100 which represents standard score.

Upon the basis of order of merit, correlations were computed by

$$6SD^2$$

the rank difference formula  $r = 1 - \frac{6SD^2}{n(n^2 - 1)}$ . Of all the tests

given the poorest index of ability was found to be quality of handwriting. The correlation of this test with general average was .02. This indicated, as might be expected from the psychological processes involved, no relationship between general intelligence or ability and such a motor performance as handwriting. The next lowest correlation was found between Thorndike's understanding of sentences and general ability. Here the correlation was .26. The children's own comments testify to the fact that they found the test uninteresting in both form and content. Thorndike's visual vocabulary, on the contrary, elicited the keenest interest, and the correlation with general ability was found to be .62.



TABLE II

*Correlations with General Ability*

Word Building—Whipple .....	.65
Visual Vocabulary—Thorndike .....	.62
Opposites—Thorndike .....	.57
Courtis Arithmetic—speed .....	.57
Courtis Arithmetic—accuracy .....	.52
Kansas Silent Reading—rate .....	.52
Trabue Completion (alpha) .....	.43
Kansas Silent Reading—comprehension .....	.42
Rate of Handwriting .....	.41
Ayres Spelling—sentences .....	.29
Ayres Spelling—columns .....	.26
Thorndike Reading .....	.26
Quality of Handwriting .....	.02

These results obtained from the Thorndike scales suggest that the more interesting the test the less erratic the scores. In four instances, in Thorndike's scale for the understanding of sentences, unexpectedly high scores were obtained by slow, plodding pupils whose reaction to anything out of the ordinary is usually temporary mental confusion. These same pupils obtained low scores when confronted by the visual vocabulary, the Trabue completion, and other tests which present novel features and require less restricted associative processes. Comprehension and analysis of a passage demand a different type of mental activity from adaptation to a novel situation. The latter depends primarily upon the utilization of past experience in new combinations or settings, rather than upon repetition of a practiced performance, relatively habitual or familiar, such as reading a passage and reproducing certain parts of it. It goes without saying that pupils do not exercise their best efforts in monotonous tasks.

Between general ability and Ayres spelling in columns the correlation was .26, between general ability and Ayres spelling in sentences .29. The slightly higher correlation may depend upon the fact that it requires greater mental effort to grasp both the content of the sentence dictated and the spelling of the words than merely to grasp separate words, each representing a specific habit already relatively automatic. The next correlation in order of magnitude was rate of handwriting which was .41, adding evidence to the theory that speed and intelligence are related. The correlation between quality and speed of handwriting was found to be —.12, which agrees with Starch's findings (*Educational Psychology*, p.

313). Since legibility of penmanship does not necessarily indicate general intelligence this result is not surprising. Kansas silent reading (comprehension) gave a correlation of .42, Trabue completion, scale alpha .43, Kansas silent reading (rate) .52, Courtis arithmetic (accuracy) .52, opposites .57 and word-building .65.

In order to obtain one general arithmetic score, the scores obtained for all fundamental operations for each individual were averaged according to the decimal method employed for the general averages. By a similar method rate scores were obtained, rate being measured by considering the median number of examples attempted as the standard for the grade under consideration.

During the same year that these tests were given to detect mental ability physical measurements of the same children were made under the direction of Dr. Marion Weston. These measurements consisted of height, weight, lung capacity, and posture. A minus correlation was found between the average of such physical measurements, and the mental averages of the group of sixty, indicating that the physically developed individuals of the group did not happen to possess the greatest mental ability. Those, however, whose health was uniformly good enough to permit regular attendance, or whose mental resistance presented an obstacle to contagion thru influenza, made better average scores than the pupils whose attendance was so irregular as to make it necessary to be absent from some of the tests. The correlation of lung capacity with mental ability was .20, the highest of all the physical measurements considered. Weight gave a correlation of —.76.

With the omission of handwriting, the average of the correlations found between the different tests given and general average was .46, which, although low, leads one to suspect some definite relationship between this group of tests and general intelligence, or ability. In every instance, of course, the probable error, accord-

$$1 - r^2$$
 ing to the formula  $P.E. = .67449 \frac{\text{---}}{\sqrt{N}}$  is sufficiently large with a

group of sixty to render the correlations less significant than their face value would indicate. For example, the P. E. of .46 for sixty cases is .068; but since  $r$  is more than four times P. E., relationship may be considered to exist.



TABLE III  
*Correlations Between Tests*

Kansas Silent Reading—comprehension and speed .....	.60
Courtis Arithmetic—speed and accuracy .....	.55
Visual Vocabulary and Trabue Completion .....	.43
Visual Vocabulary and Word Building .....	.36
Opposites and Word Building .....	.32
Opposites and Visual Vocabulary .....	.25
Kansas Silent Reading and Word Building .....	.24
Thorndike Reading and Visual Vocabulary .....	.13
Thorndike Reading and Word Building .....	.05
Handwriting—speed and legibility .....	.12
Thorndike Reading and Courtis Arithmetic .....	.27

Some of the intercorrelations found were as follows: visual vocabulary and word building .36, Trabue completion and visual vocabulary .43, opposites and word building .32, Thorndike reading and word building .05, visual vocabulary and opposites .25, Thorndike reading and visual vocabulary .13, Kansas silent reading and word building .24, Thorndike reading and arithmetic —.27, Kansas silent reading—rate and comprehension .60, Courtis arithmetic—rate and accuracy .55. The closest relationship was found between rate and comprehension of reading.

It is evident from this investigation that the best tests of general ability or intelligence are closely related to the use of language, which, according to the theory of "identical elements" may possess a considerable amount of transfer value. Command of language is undoubtedly a gauge of ideas. The employment of symbols of which words are an example, also indicates mental development. It seems, therefore, that a language test is a somewhat more reliable index of intelligence than is any other type of test. It is patent also that understanding of the language of any test is a fundamental condition of success in that test.

As a result of an extended period of experience in the practice and supervision of testing children, and in conducting extension courses for teachers, in the subject of tests of intelligence and efficiency, the following conclusions have suggested themselves: most of the tests present a problem too difficult for teachers untrained in the art of administering and scoring tests. Others require too much time of both teacher and pupil. Others test too narrow a limit of an individual's ability. Instead of fewer tests, however, more are needed, in order that a wider latitude of choice may be possible.



Ayres handwriting scale presents many desirable features. It affords an opportunity for auto criticism by the pupil, and therefore an incentive for improvement. Depending as it does upon legibility it emphasizes function. In these respects it furnishes a valuable teaching device. Ayres spelling scale, though somewhat intricate for beginners, commends itself through the care exercised in its derivation and standardization, and the fact that the word groups of equal difficulty are carefully graded. The Kansas silent reading test, though easily administered and scored and thoroughly objective, calls for certain arbitrary answers, perhaps a trifle too exacting. For example, the insertion of one word too many may invalidate an answer, though it is evident that the pupil understood clearly the meaning of the subject matter. The Trabue completion is desirably objective in form, and progressively graded in difficulty, permitting a wide range of achievement. The scoring, however, is very difficult for the average teacher unskilled in such work, and indeed no small problem for the experienced examiner. The Courtis tests in arithmetic, though they include only the four fundamentals, are easily administered. The directions for giving are simple and are printed on the test sheets. The results are easily scored by an answer card. Again, however, the "class record sheet" is a veritable puzzle to the novice.

As tests of intelligence, the opposites and word-building present more of a problem situation than do tests depending upon habits already acquired, such as spelling, writing, fundamental operations in arithmetic, and reproduction of material read. The search for an opposite demands the exercise of lively associative processes and selective judgment. In addition to these activities, word-building involves accurate recall and constructive imagination.

The result of a questionnaire among fifty elementary teachers indicates that from their point of view the ideal test of both intelligence and school efficiency, though like most ideals impossible of attainment, should be primarily a constructive and interpretative language test based on minimum essentials of the subjects of the curriculum. It should be so thoroughly objective in character that answers are obviously either correct or incorrect. Those open to subjective interpretation interfere with uniformity and accuracy. A test should be sufficiently brief to occasion minimum fatigue effects

on the part of both teacher and pupil. It should be so devised that pupils could correct their own papers from a key. It should consist of a considerable number of graded steps so that slight gradations of individual rank differences may be somewhat definitely determined. In finding correlations a large number of pupils with the same score cover up individual differences. This undesirable condition is more nearly obviated by the Kansas silent reading test than by Thorndike's understanding of sentences. A test should be graded from almost zero difficulty to a relatively unattainable standard, as in the Trabue completion several of the most recent group scales and many of the army tests. In this way limits may be undefined at each extreme, leaving sufficient latitude for extremes of achievement. It would be more convenient were all tests so arranged as to have all standard scores for a given grade numerically identical. A test should be simply stated and easily administered. The directions should be brief, and if possible printed on the test sheet so that the pupil may not be required to remember them, or to waste time and energy endeavoring to understand the examiner's directions. A test should be sufficiently interesting in character to seem worth while and to hold the attention of children. Such a test to determine a child's fitness for a school grade would be welcomed by busy teachers who are already too much hampered with routine detail to assume the additional burden of administering and scoring the numerous intricate tests at present in circulation. These teachers are still depending upon their own standards and requirements in the various branches of the curriculum, rather than learn the complex art of administering and scoring standard tests skilfully. Considering all that is required of the elementary teacher this attitude is to be expected. She understands her work to be primarily teaching, not testing; and until the test problem is simplified, she is not likely to appreciate the value of testing as a means of improving instruction. These conclusions have been reached through direct contact with the teachers in question.

#### *Conclusions:*

Of the current standard tests employed in this investigation, those involving the most language ability were the most reliable indices of general school ability or efficiency gauged by general success in the entire group of tests, by teachers' estimates of individuals, and their actual school grades in daily school work.

Of all these tests the least interesting in form to the pupil were of least diagnostic value.

The relationship between general physical and mental measurements was negative.

Of the intercorrelations between individual tests, the highest was found between comprehension and speed in reading, the next between accuracy and speed in arithmetic, the lowest between speed and legibility in handwriting.

The ideal test should present a wider range for achievement, have a larger number of graded steps, should be more objective, and more easily administered and scored than the majority yet standardized and now in circulation.



# The Reliability and Significance of Tests of Intelligence

EDWARD L. THORNDIKE

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IT IS the purpose of this article to present certain facts concerning the reliability and significance of a twenty-minute examination of the general type of the Army Alpha but so arranged that anybody can give it who will exercise the ordinary precautions used in conducting any school examination. The examination itself is not suggested for use, since we have in the Alpha, Pressey-Pressey, Otis, Virginia Survey, and the new National Research Council tests, instruments of the same general character and it is undesirable to multiply tests except to gain some special advantage.

The available facts concerning the reliability and significance of these are however somewhat meagre; and it is probable that the facts which I have to present will hold approximately true for any well-planned twenty-minute written intelligence examination.

Only so much of a description of the examination is offered here then as is necessary for proper understanding and use of the facts that follow concerning reliability and significance. It comprises 8 tests, (1) written directions, (2) arithmetical problems, (3) synonym antonym, (4) selection of the reasonable answer (5) checking the largest and the smallest number in a column, (6) completing a number series, (7) memory of pictures, numbers and irregular diagrams, and (8) verbal analogies. The candidate begins with test 1 to 0 minutes, and works without pause through all the tests, in so far as he chooses; but at various times he is told "Even if you haven't finished test 1, begin test 2 now," etc. These times are 2, 6, 8, 10, 11½, 14, and 18 min. The score is  $2 \times r$  for Test 1,  $2 \times r$  in first 5 problems of Test 2,  $4 \times r$  for second 5 problems of 2,  $1 \times (r - w)$  for 3,  $2 \times r$  for 4,  $1\frac{1}{2}r$  for first 5 of 6,  $3 \times r$  for the last 5 of 6,  $1 \times r$  for 7, and  $1 \times r$  for 8 (in which  $r$  stands for number right,  $w$  for number wrong). The maximum obtainable is thus 145. One 4th year high school pupil out of about 200 obtained a score of 144. The median score for 257 6th grade city pupils

was 45; for 55 7th grade city pupils it was 70; for 100 adult (21-30) skilled mechanics it was 70; for 267 4th-year high-school students and college freshmen it was 100. Roughly the scores in it correspond to Alpha scores (unweighted) as follows:

20 min. test ...	10	15	20	25	30	35	40	45	
Alpha .....	25	30	35	40	45	50	55	60	
20 min. test ...	50	55	60	65	70	75	?	?	100
Alpha .....	65	70	75	80	85	90	?	?	about 135

For a single trial with such a test the probable error is from 4 to  $8\frac{1}{2}$  according as the score obtained is from 35 to 100.  $6\frac{1}{4}$  is about one-fifteenth of the difference between the scores of a feeble-minded and a superior adult, or about 1 year of mental age.<sup>1</sup>

The facts whence the above determinations are derived are two trials with two different forms of the test on 146 sixth-grade pupils, 105 eighth-grade pupils, 46 adult tradesmen, 54 army officers, and 42 university students.

This is not a satisfactory degree of precision, but it is about what may be expected from a 20-minute test. A Stanford Binet score, representing perhaps a 50-minute examination, has a P. E. of about 5 months of mental age, and an Army Alpha taking some 40 minutes has a P. E. of about  $5\frac{1}{2}$  (unweighted) points.<sup>2</sup> This is about one-twentieth of the difference between the scores of a feeble-minded and a superior child or about  $\frac{3}{4}$  year of mental age.

It thus appears that an examination of twenty to fifty minutes, whether oral or written, is adequate to make with surety only coarse distinctions among individuals. It is adequate, if properly used, to decide whether an individual should be examined further with respect to any practical issue, such as commitment to an institution, or promotion in school, or employment at a certain job. Proper use means among other things to re-examine all those within 3 or 4 P. E. of the crucial line. The custom of passing all those whose scores are slightly above the crucial line seems extremely dangerous.

<sup>1</sup>I take this opportunity to correct the obvious error on p. 31 of Vol. III of This Journal, where P.E. is stated to be a certain quantity  $\times \sqrt{2}$  instead of  $\div \sqrt{2}$ , and to apologize for my own careless proof-reading.

<sup>2</sup>The Probable Error of the Stanford Binet is as computed by Otis from the scores in the two halves of the examination. The probable error computed from the correlation between the Stanford Binet and another examination of the same type might, of course, be greater.

The question concerning the significance of the test upon which I have data is substantially, "Do verbal and non-verbal examinations measure the same mental ability?" The answer being that they do not, the further question arises concerning the magnitude of the difference. If they measure the same ability, the correlation between the scores for the same individual in the two examinations will, when corrected for attenuation, be 1.00, or vary around 1.00 as a central tendency. Any shortage below 1.00 is a measure of the magnitude of the difference between the abilities.

The facts are as follows: The raw correlation between two-thirds of the test described and the Thorndike non-verbal test in the case of 108 6th grade pupils is .52. The self correlation of the test described is probably above .70 and almost certainly is not under .60.<sup>3</sup>

The obtained self-correlation for the two-thirds of the Thorndike non-verbal examination is .76. The correlation between verbal and non-verbal when corrected for attenuation is thus presumably .71 and almost certainly not over .83.

The raw correlation between the examination described here and the Thorndike non-verbal in another group of 147 6th grade pupils is .435. The self correlations are .68 and .89. The correlation between verbal and non-verbal, when corrected for attenuation, is thus presumably .56 and almost certainly not over .67.

The raw correlation between this examination and the Thorndike non-verbal in a group of 46 enlisted men of wide variability is .76, the two self correlations being .85 and .91. The correlation corrected for attenuation is thus .86.

The same raw correlation in a group of 43 commissioned officers is .28½, the two self correlations being .40 and .49. The correlation corrected for attenuation is thus .64.

The raw correlation between the Army Alpha and two-thirds of the Thorndike non-verbal in the case of 108 sixth-grade pupils is .47. The self-correlation for Alpha was not determined in this group but almost certainly would not be less than .75, since Alpha correlates with the examination described in this article in this group to an extent of .75. The self-correlation for the two-thirds of the

<sup>3</sup>This examination correlates with the Army Alpha in this group of cases to an extent of .75. For a different group of 147 6th grade pupils its self correlation is .68. For 31 8A pupils it is .46. For 44 8B pupils it is .59. For 46 adult enlisted men it is .85. For 43 commissioned officers it is .49.



Thorndike non-verbal is .76. So the corrected correlation is presumably about .60 and is almost certainly not higher than .70.

The raw correlation between the Army Alpha and the Thorndike non-verbal in the case of the 46 enlisted men is .79. The two self correlations are .95 and .91. The corrected correlation is thus .86. For the 43 commissioned officers the corresponding facts are .36, .95 and .40, and .58.

In general the examination described here or the Army Alpha correlates with the Thorndike non-verbal slightly less than .7, correction for attenuation being made ( $.68\frac{1}{2} \pm \text{P.E. of } .03$ ).

This estimate is further supported by the raw correlations in certain groups where the data do not permit correction for attenuation. Thus in 169 fourth-year high-school pupils the correlation between the examination and the Thorndike non-verbal is .49. In 12-year olds (colored) in grades 6, 7 and 8, it is .54 ( $n=31$ ). In 13-year olds (colored) in grades 6, 7 and 8, it is .59 ( $n=49$ ). In 14-year olds (colored) in grades 6, 7 and 8, it is .49 ( $n=50$ ).

Intelligence as measured by the one kind of instrument then seems to be something very different from intelligence as measured by the other. This is due probably largely to the difference between verbal and non-verbal content, but partly also to the greater weight attached to speed in the verbal test. With its explanation, however, we are not here concerned. The primary fact is that intelligence is not one thing but many. The abilities measured by a speed test with language and mathematics are not identical with, or even very similar to, those measured by a test with pictures and less exacting in speed.

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## EDITORIAL

"Educational measurements may be the last word in school procedure," said Miss Winthrop, teacher of the 5A grade, as she entered the principal's office, "but I do not see that they have anything to offer me as a class-room teacher. Here I have been working for hours, scoring and tabulating the Thorndike reading tests, but what do I get out of it when I have the work completed?" "This is not the first time that I have heard that question," replied the new principal, motioning her to a seat, "and I shall be greatly interested to hear what you have to say about it. Your implied criticism of the measurement movement is a serious one, for if such work fails to benefit the classroom teacher it may persist for a time as a fad, but it is not likely to have any permanent influence upon education. We may talk all we like about school organization, administration and supervision, but the real work of education is done in the classroom. All the other activities are justifiable only in so far as they make the work of the classroom easier and more efficient."

*Educational  
Measurements  
and the Teacher*

"I am glad to hear you say that," rejoined Miss Winthrop "for it goes right to the heart of my difficulty. Instead of making the class work easier, measurements only seem to add to my already heavy burden of clerical work. I have papers to mark, and records to keep, and any number of blank forms to fill out. This work takes time, and is not sufficiently attractive to make the prospect of its increase at all agreeable. I like to teach, but the keeping of records is the merest drudgery. Now it seems to me that measurements will involve vastly more record keeping than before, and there is no end to the amount of manipulation that these records may be subjected to. However, I should not object to a considerable increase in distasteful clerical work, if I felt that the outcome justified the effort. This is where I am in doubt. Suppose I have a record of the score of each pupil in the Thorndike reading tests, the Monroe arithmetic tests, the Starch problem test, the Ayres spelling scale, the Hahn-Lackey geography scale, the Bell-McCollum history tests, and so on, what am I going to do with it: My class goes on just the same. That pupils in the same class show striking differences in ability I knew before. But if the class is to progress as a unit my task is to eradicate these differences as much as possible, to hold the bright pupils back and spur the dull ones on, and thus to make the group as homogeneous as possible. How, then, do measurements help me in teaching my class?"

"The questions you raise," replied the principal, "would require much more time than we have this afternoon, if we should consider them in detail. Let me merely make two or three suggestions. It is true that at the present time the class is the unit of instruction. By far the greater part of the teacher's time is spent in "teaching her class." Many insist that this is the most important thing that the teacher can do. So long as this is the goal, the chief significance of measurements for the classroom teacher is to show her how her class stands with reference to other classes, and how closely grouped or widely divergent her pupils are. After this information is gained she knows no better than before what she should do about it. The class may stand high, but perhaps it ought to stand high, even higher than it does. It may stand low, but perhaps there are good reasons why it should stand low. Perhaps but for the persistent, intensive and consecrated efforts of the teacher it would stand much lower than it does now. To take a set of measurements and attribute praise or blame to the teacher for the high or low standing of the class is not only unjust but misleading. We need at least



two measurements separated by a considerable interval of time to warrant any conclusion as to the teacher's influence on a class. The class may be widely scattered or closely bunched, but in neither case is it likely that the teacher is responsible, nor will she be able to make much change in the conditions even after she has discovered them.

"But is class instruction the highest aim of the teacher? Studies of the learning process show that learning is a highly individual matter. Does not the teacher 'teach her class' too much? Should we not cease trying to drive forty pupils abreast, and endeavor to devise methods of stimulating individual pupils to put forth effort commensurable with their abilities? In that case we need accurate diagnosis of individual attainments. It is here that measurements are of the greatest assistance, in securing an objective evaluation of the attainments of the pupil as evidences of strength or weakness in various lines of endeavor. From this data 'profiles,' or pedagogical pictures, can be constructed which may be of the greatest value in encouraging or stimulating the pupil to greater exertions.

"That this will require more detailed and extensive bookkeeping is unquestionable. We need to devote a great deal of time and thought to devising simple and easily applied scales and tests. Meantime the teacher herself can do much to reduce the labor of scoring and recording the results of tests. Most of the standard tests can be scored by the pupils themselves in the fifth and higher grades. After the test let the papers be collected and redistributed indiscriminately, so that no pupil knows where his paper goes. The teacher reads the correct answers and the pupil marks the paper correct, incorrect or partly correct, according to the scoring indicated. Let the pupils interchange papers and the teacher read the correct answers again, the second pupil checking the work of the first. In this way an entire set of papers can be scored with a high degree of accuracy in about twenty minutes. In like manner the pupils can be enlisted to tabulate the results, and by dividing up the work and having them check each other, an extensive tabulation can be completed in a short time. Thus most of the bookkeeping can be delegated to the pupils, much to their benefit and delight."

"I admit," said Miss Winthrop, "that this puts the subject of measurements in a somewhat different light, and I shall be much interested to see how well my pupils can do the scoring and tabulating, and to what extent I can use the results to individualize my instruction."

J. C. BELL.

## NOTES AND NEWS

The general topic of the meeting of the New York Society for the Experimental Study of Education on April 9 was "Problems in the Teaching of Mathematics." The speakers of the evening were John C. Stone, Montclair State Normal School, "Socializing Elementary Arithmetic," and Professor David Eugene Smith, Teachers' College, "Mathematics in the Junior High School."

At the meeting of the New York Branch of the American Psychological Association, on April 26, the following papers were presented: "The Intelligence of Troops Infected with Hookworm," by Garry C. Myers; "Preliminary Report on the Thorndike College Entrance Examinations as Applied to Columbia University Freshmen," by Ben D. Wood.

At the annual meeting of the American Psychological Association at Cambridge in December, a Section of Clinical Psychology was formed. The members of the American Association of Clinical Psychologists established two years previously were constituted the initial membership of the new Section, this association disbanding by its own action. The Section was organized with Dr. Francis N. Maxfield as Temporary Chairman and Dr. Augusta F. Bronner as temporary Secretary. To be eligible for membership in this Section the candidate must, beside being a member of the American Psychological Association, have as a minimum requirement: (1) The Ph. D. degree in psychology; (2) A record of special preparation in some field of clinical psychology; (3) Published or prepared for publication a contribution of importance to the literature of mental tests or of clinical psychology; (4) A part of the applicant's time must be regularly devoted to making clinical examinations in psychology; (5) Especially qualified persons, not eligible under No. 1 who have fulfilled other requirements and have done distinguished work in clinical psychology, may be eligible for membership. Nominations for membership, signed by two members of the Section and accompanied by information in regard to the candidate's qualifications should be sent to Dr. Rudolph Pintner, Ohio State University, Columbus, Chairman of the Committee on Membership.

The report of the committee of the American Psychological Association on qualifications for psychological examiners and other



psychological experts has been mimeographed and sent to members. The report recommends that the Council appoint a permanent committee of five members to issue certificates to qualified "consulting psychologists." The requirements in theoretical training, in professional technique, and in technical information are given in some detail. At the annual meeting last December it was voted after an animated discussion that the report be accepted, the committee discharged, and a committee of five members be appointed to consider methods of procedure for certifying consulting psychologists. This committee is preparing an extended report on federal and state methods of certification, legal aspects of certification, methods of issuing certificates, and training and qualifications of consulting psychologists.

Dr. and Mrs. Sidney L. Pressey have recently completed norms, with distribution tables, for their "Primer" and "Cross-Out" scales. These norms are based upon nearly 1000 cases per grade, and may be considered reasonably satisfactory. A large survey, now under way, is expected to add 40,000 cases shortly. These investigators have also devised a Scale of Attainment in reading, arithmetic and spelling for the second grade. The scale includes four tests, can be applied in twenty-five minutes, and the papers can be scored at the rate of one per minute. This scale should prove a valuable supplement to the "Primer" scale of intelligence. The latter has proved so popular that over 55,000 copies have been sent out within the last eight months.

The Thurstone Intelligence Test for College Freshmen and High School Seniors has been given to 27,251 students in colleges and normal schools during the past year. The test contains 168 short problems of five or six different types arranged in cycle formation. Thirty minutes are allowed for the test, and the papers may be scored with stencils at the rate of about twenty per hour. No oral instructions are given by the examiner, as they are all printed in the examination pamphlet. Information regarding the test may be obtained from Professor L. L. Thurston, Carnegie Institute of Technology, Pittsburgh, Penna.

Superintendent Ernest C. Witham has recently issued a Standard Geography Test for Europe. The test contains an outline map of Europe on which the pupils are to write letters corresponding to the names of fifteen countries, the numbers of fifteen cities, the



numbers of five seas, the names of five mountain ranges and five rivers. The pupils are also asked to indicate the chief industries and products of ten countries.

The organization of the Wisconsin Association for Educational Research indicates the rapidly growing interest in the study of quantitative as well as qualitative problems of education on the part of the school men of Wisconsin. The personnel of the association includes representatives from practically every field of educational work in the state. Teachers, supervisors, superintendents, members of normal school and university faculties who are studying educational problems are the charter members of the society. The purpose is not only to encourage the scientific study of educational questions but to keep the members closely in touch with what each is actually doing in the way of educational investigation and experimentation. By means of a bulletin issued at regular intervals the members can announce intensive studies and ask for co-operation or for the results of similar studies completed or under way by other members in the same or similar subjects. They can learn definitely and economically to whom to go for specific information and can avoid a repetition of unnecessary effort. The state department of education in Wisconsin, is well represented in this group. Dr. W. W. Theisen and Mrs. Cecile White Flemming, supervisors of educational research in the state department have been influential in the formation of the organization. The officers for the year 1919-20 are Supt. C. J. Anderson of Stoughton, president; Cecile White Flemming, state supervisor of educational measurements, secretary-treasurer.

Another evidence that Wisconsin school men are keenly interested in scientific study which makes possible the improvement of the tools and practice of education is the addition of a section on educational measurements to the list of meetings held by the Wisconsin State Teachers' Association and also by the Southern Wisconsin and other sectional state teachers' associations. These sectional meetings have in each instance been largely attended. The growth of the scientific spirit in education within the state is shown by the appearance on the program of local superintendents and supervisors with their discussions of test results in the various school subjects for the improvement of methods of instruction; and their emphasis upon the value of group intelligence tests for the

sectioning of pupils on the basis of ability and the adaptation of materials and methods in accordance with individual pupils' needs.

Professor Edgar Riley, Principal of the Training School in the state normal, Platteville, Wis., is chairman of the Educational Measurements section of the Wisconsin State Teachers' Association. Mrs. Cecile White Flemming, State Supervisor of Educational Measurements is secretary of the section.

The University of Manchester, England, announces the establishment of a library for deaf education at that institution by the Carnegie United Kingdom Trust. It is intended to make this library as comprehensive as possible, and to include in its works dealing with the various systems of teaching the deaf, speech training, psychology of speech and of hearing, phonetics, acoustics, and the anatomy, physiology and diseases of the ear. The books will be available to all individuals, societies and institutions throughout the United Kingdom.

Dr. Lotus D. Coffman, head of the department of education at the University of Minnesota, has been elected president to succeed Dr. Marion L. Burton, president-elect of the University of Michigan.

Dr. James Rowland Angell, professor of psychology in the University of Chicago, this year chairman of the National Research Council, has been elected president of the Carnegie Corporation of New York.

Dr. Henry W. Holmes, professor of education, has been appointed dean of the Harvard Graduate School of Education.

Mr. Eugene A. Nifenecker has been elected director of reference, research and statistics by the New York City Board of Education.

## PUBLICATIONS RECEIVED

THERESA BACH. *Educational Changes in Russia*. Washington: Bureau of Education, Bulletin, 1919, No. 37. Pp. 26.

The most of the data for this Bulletin come from the official records of the early days of the revolution in 1917, but some account is taken of tendencies during the year 1918. The outstanding features of the report are the complete secularization of the schools local responsibility for and control of the schools (now in the hands of the local soviets), the abolition of all restrictions on national or religious groups, spelling reform, government control of textbooks, and the opening of new universities (badly used under the soviet regime).

WILLIAM T. BAWDEN. *The Army Trade Tests*. Washington: Bureau of Function of Disabled Joints. Washington: Walter Reed Hospital, 1919. Pp. 67.

The monograph presents an exposition of the aims of occupational therapy, typical assignments to shops, measurement of the range and strength of voluntary movements (with charts showing improvement with treatment), type studies of movements occurring in occupational activities, peripheral nerve palsies, a list of tools of special curative value, and a study of type cases. An appendix gives an outline of the psychological service that can be rendered in a hospital.

WILLIAM T. BAWDEN. *The Army Trade Tests*. Washington: Bureau of Education, 1919. Pp. 28.

This is the report of a conference of specialists in industrial education, called by the United States Commissioner of Education to meet at St. Louis, February 19, 1919. The monograph contains the addresses of Lieut. Col. A. C. Strong, Jr., on "Army Personnel Work," describing the task of personnel organization, the classification of soldiers, the army trade specifications, trade tests, and the classification and rating of officers; of Lieut. Col. W. V. Bingham on "Development and Standardization of the Army Trade Tests," giving the sources of test material, the oral tests, the picture tests, and performance tests in certain trades; and of Lieut. Col. J. J. Swan on "Possibilities of Use of Army Personnel Methods in Industry."

Col. Swan gave a sketch of the development of employment methods, spoke of the task of standardizing human intellect, of the need for analysis and definition of tasks, of the development of



trade tests by each industry and each shop, and of the expense involved.

LIEUT. COL. W. V. BINGHAM. *Measuring a Workman's Skill. The Use of Trade Tests in the Army and Industrial Establishments.* Reprinted from Bulletin No. 30, National Society for Vocational Education, 1919. Pp. 12.

"While these trade tests were being developed, two astonishing discoveries came to light. The first of these is the rarity, the practical non-existence, of the exclusively motor-minded type of tradesman, the man who can do the job with his hands but cannot tell you about it in words. In beginning the trade test development we had expected to meet numerous difficulties due to the prevalence among manual laborers of this variety of mental constitution. We expected to find that the oral type of tests would prove useful with the more verbally minded men; but we anticipated meeting many tradesmen of high proficiency and skill who could do little or nothing with these oral questions. This expectation proved to be wholly at variance with the facts. The problem here suggested, as to whether the so-called pure type of motor-mindedness is really only a mythical abstraction, is respectfully referred to the laboratories of educational psychology. The other discovery, not wholly unrelated to the first, was the fact that in a majority of the trades the oral tests yielded more accurate differentiations of proficiency than did the performance tests. In other words, the journeyman and the expert differ from the apprentice not so much because they have greater manual skill and dexterity as because they excel in judgment, technical information, or trade knowledge."

HERBERT ERNEST CUSHMAN., *A Beginner's History of Philosophy. Vol. II. Modern Philosophy.* Boston: Houghton Mifflin Company, 1919. Pp. xxi, 407. \$2.00.

A revised and much expanded edition of a work which first appeared in 1910. The book is written primarily for students, and is a history of philosophy upon the background of geography and of literary and political history. The time covered in this volume is from 1453 to the present. There is an especially interesting chapter on the philosophy of the nineteenth century which is illustrated with helpful charts and diagrams.

EDGAR A. DOLL. *The Average Mental Age of Adults.* Reprinted from *Journal of Applied Psychology* 1919. Pp. 317-328.

Hitherto the average mental age of adults has been taken as 16, and the I. Q. has been determined on this assumption. From an

examination of the intelligence ratings in the army, and from studies on several groups of defective delinquents the author believes that this age is quite too high, and that 13 is nearer the actual adult mental age. In the army it was found desirable to employ different mental age standards for negroes and foreign-born from those used with native whites. If this represents a real difference, it raises an important question for experimental psychology to investigate. If the prognostic value of mental ages is not constant for the different races, psychology should certainly aim to discover the reason.

*Fourth Report of the Committee on Economy of Time in Education.*

The Eighteenth Yearbook of the National Society for the Study of Education. Part II. 1919. Pp. 123. \$1.00.

This is the report of the sub-committee on economy of time in learning, of which Professor Ernest Horn, University of Iowa, is chairman. The monograph contains the following reports: "Principles of Method in Teaching Writing, as Derived from Scientific Investigation," by Frank N. Freeman; "Principles of Method in Teaching Reading, as Derived from Scientific Investigation," by William S. Gray; "Principles of Method in Teaching Spelling, as Derived from Scientific Investigation," by Ernest Horn; "Principles of Method in Teaching Arithmetic, as Derived from Scientific Investigation," by Walter S. Monroe; "The Present Status of Drawing with Respect to Scientific Investigation," by Fred C. Ayer; "The Role of a Consulting Supervisor in Music," by Carl E. Seashore.

MAURICE B. HEXTER. *The Newsboys of Cincinnati*. Studies from the Helen S. Trounstine Foundation, Cincinnati, Ohio, Vol. I, No. 4, 1919. \$0.50.

It appears from this investigation that the percentage of delinquency among newsboys is much higher than among other boys of the same age. One-third of the delinquent boys brought into the Court of Domestic Relations, and one-third of the boys at the Opportunity Farm are newsboys, although such boys form only about one-tenth of all the boys at these ages. Newsboys are twice as much truant as other boys are. The delinquency of newsboys is an inevitable consequence of the associations into which their work throws them.



✓ DAVID SPENCE HILL. *Results of Intelligence Tests at the University of Illinois*. Reprinted from *School and Society*, Vol. 9, 1919. 542-545.

The Army intelligence tests were given simultaneously to almost 3500 students. The medians for different groups of students ranged between 140 and 150. There was no clear difference in score for the different college classes. Of the various schools the law and the graduate schools were appreciably the highest, the medians ranging from 150 to 160. The medians for men were in all schools and classes from 4 to 13 points higher than for women.

ARTHUR W. KALLON. *Arithmetic. Practice Exercises in Common Fractions*. Boston: School Document No. 3, 1919. Pp. 37.

These practice exercises are based upon the errors which the tests in common fractions given in the Boston schools have shown to be common. The bulletin consists of four parts, one each for addition, subtraction, multiplication and division of fractions. Only fractions having a denominator less than 16 have been used throughout. There are fourteen distinct types in addition of fractions, thirteen in subtraction, eleven in multiplication and ten in division. Forty examples are given illustrating each type.

✓ E. A. KIRKPATRICK. *Studies in Psychology, by Student Teachers for Teachers in Training and Service*. Boston: Richard G. Badger, 1918. Pp. 194. \$1.50.

The author has for many years followed the "project method" in teaching psychology to his classes. With each class some special project would be chosen, and the entire class would work on the development of that project. The present book gives the results of eight of such project studies, including habit, memory, imagination, attention, concepts, perception, feeling, and will. It is a stimulating and suggestive little book, and as it is the direct outgrowth of the work of the classroom it should prove helpful to many teachers of psychology in normal and teacher training schools.

CLINTON P. MCCORD. *Physical and Mental Condition of Delinquent Boys*. Reprinted from *Albany Medical Annals*, April, 1919. Pp. 15.

An interesting feature of this paper is a comparative chart of leading defects based on the examination of 100 boys at the Berkshire Industrial Farm, and of 1000 fifth grade boys of the Albany



public schools. Sixty-six per cent of the delinquent boys are afflicted with nasal catarrh and chronic pharyngitis as compared with seventeen per cent of the school boys. Lateral curvature shows thirty-one per cent among delinquents compared with thirteen per cent among normals. Other striking differences are in mental deficiency, delinquents eleven per cent to normals two per cent; in discharging ears five per cent to one per cent; and in rachitic remains eight per cent to one per cent. On the other hand the school boys showed nine per cent glandular defects compared with only one per cent among the delinquents. In decayed teeth, defective vision, diseased tonsils, malnutrition, defective hearing, and skin defects the percentages are about equal.

JOHN BACH McMASTER. *Brief History of the United States*. Revised and Enlarged. Cincinnati: The American Book Company, 1918. Pp. 466, xxx.

The author has held to the plan of putting in the body of the text only those statements that are essential to the development of the narrative, and introducing interesting supplementary matter in the form of copious notes, which sometimes take up half the page. There is an abundance of splendid maps, and interesting illustrations are found on almost every page.

NORAH H. MARCH. *Towards Racial Health*. New York: E. P. Dutton and Company, 1919. Pp. xiii, 320. \$2.00.

This is an English book, whose sub-title is "A Handbook on the Training of Boys and Girls, Parents, Teachers, and Social Workers." It is a general discussion of sex hygiene, and, as is usual with English books of this character, the facts, dangers, and judicious handling of sex are treated with such deftness and delicacy that even the most sensitive will have no cause to blush. The book is religious in tone and endeavors to develop ideas of sex in accord with the highest ideals of life.

HENRY RUTGERS MARSHALL. *Mind and Conduct*. New York, Charles Scribner's Sons, 1919. Pp. ix, 236. \$1.75.

This book grew out of the Morse lectures delivered at the Union Theological Seminary. The argument is in three parts. Part I, The Correlation of Mind and Conduct, deals with consciousness and behavior, instinct and reason (including instinct-actions and adaptation, and instinct-feelings and intelligence), and the self. Part II, Some Implications of the Correlation, considers creative-

ness and ideals, and freedom and responsibility. Part III, Guides to Conduct, treats pleasure and pain, happiness, and intuition and reason. Two appendices discuss the causal relation between mind and body, and the nature of outer-world objects.

LILLIAN J. MARTIN. *The Training of the Emotions*. California: Society for Mental Hygiene, Publication No. 4. 1919. Pp. 7.

The emotions of fear and rage are exaggerated and exhausting reactions which have no place in modern life, and should be brought under control. To assume the expression of rage or fear is to cultivate and develop them. When afraid, psychology says: take the bodily position that is its opposite—relax, breathe out, imitate the position of courage—and the fear will tend to disappear. Directing the attention to any emotion intensifies it, while diverting the attention decreases it.

EDWARD J. MENGE. *Backgrounds for Social Workers*. Boston: Richard G. Badger, 1918. Pp. 214. \$1.50.

This book presents a scientifically trained Roman Catholic's reaction to such questions as socialism, educational aims, moral standards, birth control, sterilization, sex-instruction, eugenics, and the status of the family in primitive medieval and renaissance times. That the author is well read and shows skill in presenting his arguments must be admitted. It is remarkable, however, what a massive effect can be produced by extracting just those aspects of another's argument that will suit one's own ends. We are far from implying that the author is not honest. The intensity of his convictions is so great that he can see only that phase of life which agrees with them.

W. R. MILES. *The Sex Expression of Men Living on a Lowered Nutritional Level*. Reprinted from the *Journal of Nervous and Mental Diseases*, Vol. 49, 1919. Pp. 208-224.

It seems to be the general testimony of the twenty-four young men who were engaged in the experiment of living on two-thirds to one-half their normal diet that the lowered food consumption decreased sexual desire and sexual reactions of all kinds.

The author concludes that any dietetic regime which definitely lessens the expression of the sex instinct, causing one sex to take but little interest in the other, would seem to be disadvantageous to the species if indefinitely prolonged. On the other hand the results clearly indicate a method of treatment for achieving restraint of sexual tendencies in pathological cases of sex dissipation.

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## AN APPROACH TO THE SYNTHETIC STUDY OF INTEREST IN EDUCATION: PART I

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### CHAPTER ONE—INTRODUCTORY

The difficulty encountered in the attempt to isolate any educational topic for discussion has been reassuringly defined by Professor Dewey: "The issues are so interdependent that any one of them can be selected only at the risk of ignoring important considerations, or else of begging the question by bringing in the very problem under discussion in the guise of some other subject. Yet limits of time and space require that some one field be entered and occupied by itself. . . . The difficulty is particularly great in the discussion of interest." Such being the case, it is necessary either to establish the most generally accepted limits of the field, or else to fix the bounds arbitrarily. To this end will be considered (1) the present occasion for investigation of the topic, (2) its aim, (3) the nature and range of previous investigations and sources, (4) the method of procedure, (5) the scope and definition of terms, and (6) the problems excluded from the discussion.

1. *Appropriateness of the Topic.*—Academic study of educational controls is probably more extensive at present than ever before in America, and attention to the by-products and methods of other sciences has done much to widen the approach, yet a comparison of the means employed to solve moot-points of theory in the United States with those of England, for example, will probably show the former to be more largely quantitative. This applies with equal force to problems of administration, supervision, and teaching. The quantitative approach is thoroughly justified by its results, by the necessity of dealing with large numbers, of substituting fact for opinion, and by



many other arguments no less conclusive. Yet however justified by results and prospects, the claims of the quantitative approach cannot be fully vindicated without the intervention of the devil's advocate, and it is this function that the present article seeks to fulfill. It is largely in the replies to the *quo bono?* that the value of real discovery becomes evident. It is then reasonable to expect some assistance toward further experiment from the analysis of inferential opinion regarding interest. Some corollaries of this assumption may be very generally stated.

(a) More concretely, there is need for some study—other than the single chapter of the standard text-books—to consider the contributions of the early child-study movement to the problems of interest from the standpoint of descriptive psychology. While these studies have doubtless been wisely evaluated and to some extent applied, further research should be stimulated by knowledge of the extent to which they confirm or invalidate empirical hypotheses.

(b) The hiatus which existed formerly between pedagogical studies of interest in the classroom, in particular studies, etc., and the purely speculative and philosophical descriptions of so-called social interests, “springs of action,” etc., has within recent years been filled by the writings of the “Behaviorist” school. The influence of genetic psychology upon class instruction and courses of study has been largely stimulated thereby and has combined with the measurement movement to provide more adequate curricula and more effective methods both of teaching and administration. There have been few attempts to separate out and analyze the principles governing the growth of individual interest from the more general studies of individual differences in connection with normal group distribution. Such analysis should thus contribute to the effectiveness of the vocational guidance, problem-project, supervised study, and similar movements.

(c) The application of the psychology of psycho-analytic treatment of neurotics to normal individuals and to the principles of education generally is very rapidly winning the sanction of responsible writers on education. While the dangers attending direct application of the methods are at present prohibitive, there is reason to suppose that methods of instruction may profit by further studies of the unconscious. War-time analyses of normal individuals suffering from shell-shock have done much to eliminate the emphasis upon sex and to extend the field of application.<sup>1</sup> Of note in this

<sup>1</sup> cf. Dr. Southard's article: *Mental Hygiene*. *Hygiene*, Jan., 1920.

connection is the bearing of such studies upon the problems of repression of interest, the diagnosis of repressed interest, the general factor of interest, et al. Discussion of this evidence as applied to education has not, to the best of the writer's knowledge, been related to other data available.

(d) There is noticeable in the current discussions of the theory of interest a very natural prejudice against the "doctrine of interest." One evident effect of this prejudice in the United States is to restrict the discussion. Stated in very general terms, there is a tendency on the part of most writers to mediate between the two evils of "soft-pedagogy" and formal discipline, and to leave it to the quantitative estimate of results and the teacher's good sense to strike a happy compromise. While the remedy lies rather in evolution than research, it would seem advisable that the cause of such prejudice be analyzed, if other than the over-enthusiasm and dogmatism of certain Herbartians and Frobelians.

(e) Finally, it will suffice to mention the most inclusive justification for a study of this kind: namely, the importance of proper diagnosis of the pupils' interest as compared with other factors of the educative process. From the standpoint of secondary education the following remark of Inglis may be taken to represent the consensus of responsible opinion: "It is probably no exaggeration to say that the adaptation of secondary education on the one hand to meet the needs of different capacities, interests, and probable futures among pupils, and on the other hand to meet the differentiated needs of society, is the most important problem of secondary education at the present time."<sup>1</sup>

(f) In summary it may be observed that an investigation of interest may profitably be undertaken for the purpose of gathering together the results of studies made from many different points of approach. Upon such data it should be possible to form a more comprehensive and applicable notion of interest than that obtained either from general experience, from educational and philosophical theory, from descriptive and analytical psychology, or from attempts at quantitative measurement alone. Such a notion should contribute something to the existing theory and application of methods—if only the incentive to further and more conclusive research.

2. *Aim.*—The proposed study seeks first by selection from varied sources to identify and correlate certain psycho-physical and social

<sup>1</sup> Alexander Inglis: "The Principles of Secondary Education," p. 75.



elements of interest at successive stages of development. By extending the conception of interest to include the entire range of popular and scientific denotation, it will seek to indicate the nature, development, and effect of the significant forms of its expression. In this course certain relationships are noted which suggest an approach to the further investigation of their educational value. In the main this value should consist in a conception of general principles of motivation whose validity is dependent upon accurate diagnosis of interest. As applied both to the periods of school life and to the stages of instruction in a single subject, this expression of interest is obviously determined by the other chief factors in experience—thought or knowledge, and action. The final chapter, which outlines the educational bearing of those preceding, considers these determinants of motivation in order to indicate an approach towards standardization of the learning process. Only tentative conclusions are reached. Hence discussion of the study is rather descriptive than expository.

3. *Previous Investigations and Sources.*—It will be helpful here to distinguish briefly the main classes of contributory material by selecting certain representatives of each class by which the student can cover the field with the greatest economy of time. If the material be divided first into three general classes, the first (*a*) may include those works in which the analysis of interest is largely introspective. Among these may be further distinguished those with a direct pedagogical reference and those without. The second class (*b*) may include the various forms of descriptive psychology, ranging all the way from the results of laboratory analysis to accurate biographies of childhood and adolescence. The intervals in the range are marked by the divisions of purely analytic psychology, social psychology, and biological studies of various degrees of scientific tenor. The remaining class (*c*) for lack of a better term may be called statistical. Here belong the child-study and other investigations to determine by group analysis the nature of interest and the effect of various influences upon its expression. It should be noted that each of these classes is further distributed between the strictly pedagogical and the strictly psychological approach and also between the direct and the incidental study of interest. In spite of the greater difficulty of adaptation, the latter classes are generally speaking the more reliable.

(*a*) It is not surprising that the field of introspective psychology



is the one most fertile for the student of interest. We know that a particular feeling has certain qualities for us, but not why it has them. "Warmth and intimacy" have no objective criteria. Hence any account of the affective process which bridges the gaps of the physiological approach on the one hand and is free from a teleological bias on the other, is likely to square best with the facts and to provide the most satisfactory basis for further analysis. The statement is probably correct that no single mental trait has yet been adequately measured, and the inference as to the role of feelings which is based upon their expression under prescribed conditions must be confirmed by introspective judgment to win acceptance. Thus in spite of its generality and on account of its many points of contact with others, this field furnishes the ground work for the student of interest in education. Its important contributions are strictly in harmony with scientific method in that judgment is brought to bear upon all the facts of all the sciences pertinent to the subject of inquiry.

Of the directly pedagogical literature the basis is of course found in J. F. Herbart's *Outlines of Educational Doctrine*<sup>1</sup> and *Science of Education*,<sup>2</sup>—together with the critical accounts of Adams,<sup>3</sup> Graves,<sup>4</sup> and Tompkins.<sup>5</sup> Herbert's contribution to the study of interest consists in his rough analysis of the state itself,<sup>6</sup> in the relation of interest to other factors of the learning process and to the development of character, and in the move toward alignment of both sciences with wider teaching experience and observation. With the passing of the "doctrine" as a cult and the rapid development of analytic psychology, we have clearly distinguished what is valuable in the Herbartian theory from what is not.<sup>7</sup> The increasing recognition of the child plus the situation as the unit of

<sup>1</sup> Lange and DeGarmo's translation.

<sup>2</sup> H. M. and E. Felkin's translation.

<sup>3</sup> John Adams: "The Herbartian Psychology Applied to Education; The Evolution of Educational Theory," p. 322ff.

<sup>4</sup> F. P. Graves: "History of Education in Modern Times," pp. 198-220.

<sup>5</sup> A. Tompkins: Herbart's Philosophy and his Educational Theory. *Educational Review*, Chapter XVI, pp. 233-243.

<sup>6</sup> "Outlines," Chapter V; "Science of Education," Book II, Chapter III. The analysis here given is never entirely excluded from modern scientific accounts; e.g., S. H. Rowe: "Habit Formation and the Science of Teaching," p. 136ff.

<sup>7</sup> As often emphasized, Herbart's chief inconsistency lies in regarding ideas as the psychological cause of interest and interest as the pedagogical means of obtaining ideas.

endeavor instead of the class, promises to release this valuable element from formalism—due rather to his disciples than to Herbart himself—and to interpret it in the light of fuller knowledge. It is thus in general true that contributions to the study of interest from the field of purely introspective thought consist largely in these interpretations of Herbartian principles modified and enriched by subsequent application and reflection. Dewey's monograph, *Interest and Effort in Education*, may alone serve to illustrate the real value of recent pedagogical works of this group. Conspicuous among the strictly psychological contributions by the "direct" method is W. Mitchell's *The Structure and Growth of the Mind*.<sup>1</sup> The analysis here made of interest as a factor in universal experience is probably the most inclusive and adequate to be found, and the comparatively invincible logic of the positions outlined recommends them as thoroughly reliable hypotheses where established fact is insufficient to provide suitable explanation of the behavior involved. Such confidence is further justified by the fact that the work is in no sense educational in purpose and the phenomena of interest are not isolated from other mental phenomena. As such it alone may represent the direct psychological approach.<sup>2</sup>

(b) It is difficult to select from the wide contribution of analytic and descriptive psychology to the study of mental traits. For the entire physiological approach to interest the following are essential: W. McDougall, *Physiological Psychology*; Th. Ribot, *The Psychology of Attention*; E. L. Thorndike, *Educational Psychology*, Vol. III; F. Arnold, *Attention and Interest*; and E. B. Titchener, *The Psychology of Feeling and Attention*. Such general treatments will frequently require reference to such works as G. F. Stout's *Analytical Psychology* and W. H. Howell's *Physiology*.

<sup>1</sup> London, 1907. The author distinguishes the direct (or introspective) explanation of experience as that mainly concerned with the growth of the mind through use, the indirect being concerned with the physical account of experience. For brief critical appreciation of Mitchell's treatment of interest see J. M. Baldwin: "Thought and Things," III: 13, whose "Genetic Theory of Reality" (1915) contains a further development of this treatment of interest.

<sup>2</sup> Although the entire range of critical and impressionistic writing belongs properly under this head. From among such brief treatments as will readily occur to the reader, the following may be mentioned as excellent:

W. C. Ruediger: "Principles of Education," Chapter XV.

P. Sandiford: "The Mental and Physical Life of School Children," Chapter XIII.  
Strayer and Norsworthy: "How to Teach," Chapter III.

W. C. Bagley: "School Discipline," Chapter IV.

E. A. Kirkpatrick: "The Individual in the Making," Chapter II.



Distinguishing from the above such studies of interest as stress the biological and social aspects, one finds numerous secondary treatments that compare favorably with original investigations in scope and which of course are more readily adapted to educational application. The approach can probably be covered sufficiently by J. M. Baldwin's *Mental Development: Social and Ethical Interpretations*; K. Groos, *The Play of Man*; E. A. Kirkpatrick, *Genetic Psychology*; and W. McDougall, *Introduction to Social Psychology*. These should be supplemented by M. W. Keatinge, *Suggestion in Education*; J. Lee, *Play in Education*; H. Marot, *Creative Impulse in Industry*; M. Nicoll, *Dream Psychology*; G. Wallas, *Human Nature and Politics*; and W. A. White, *Mechanisms of Character Formation*. This material contributes to such fundamental topics as the source and role of interest in all activity, its familiar manifestations in the process of growth, the modification of normal biological tendencies resulting from social contact, and the implications of socialized expression.

(c) The caption "statistical" has been chosen to cover the great variety of studies—mainly educational in aim—which have recorded and compared the preferences, the environmental conditions, and the specific reactions of groups of children as means for diagnosing interest. The range of these child-studies by questionnaire methods from 1895 to 1905 may be readily observed from the indices of such journals as the *Pedagogical Seminary* and the *Child Study Monthly* for these years. Other methods include the enumeration of objects collected at different ages, analysis of compositions, inference from definitions of various objects and abstract ideas, from free drawings, from games, from ideas longest remembered, from verbal replies to prepared questions, and from observation of the child's reaction to pictures, stories, and other amusements. The two lines of study represented by Terman's *Measurement of Intelligence* and Link's *Employment Psychology* are defining quantitatively some few "specificities" that enter into all interest and relating these to environmental controls. This approach, while chiefly of indirect value at present, is certain to contribute most eventually.

The fact that very few of such studies have made any real contribution to the theory of interest renders these few easy to distinguish. The method and value of three types of these latter may be briefly illustrated by Croswell's "Amusements of Worcester School



Children;”<sup>1</sup> Chapman and Feeler’s “The Effect of External Incentives on Improvement;”<sup>2</sup> and Thorndike’s “Early Interests; Their Permanence and Relation to Abilities.”<sup>3</sup>

Croswell received 2,000 replies to a topical syllabus by which children were asked when, why, and what games and toys were played with and which were favorites. One thousand replies were received from each sex. These were tabulated under various heads to show by how many each amusement was mentioned and by how many it was preferred, of each sex. Each classification under this scheme is represented graphically by per cent and age to show “curves of relative interest.” These indicate the growth of “special” interests and show the nascent periods in a number of groups. Thus “the curve of games of chase shows that only eleven per cent of all amusements mentioned by boys of six years are of this character, but at nine years they amount to over nineteen per cent and at sixteen they have fallen to less than four per cent.” Each classification is carefully analyzed from many points of view and much collateral material is utilized to substantiate the conclusions drawn. The bibliography is entirely complete for 1899. Confidence is further justified by the fact that in many cases the teachers talked over the questions with the children, but what distinguishes the study from others of its type is the thorough analysis by other evidence. As a fair indication of the normal expression of genetic interests in one locality (seven schools from widely different communities were examined), it is a valuable supplement to such generalized evidence as that presented by Groos and other child biographers. By recording and classifying all forms of spontaneous activities, the data afford much more assistance in the analysis of interest than closer analysis of certain selected activities.

A parallel-group study based directly on elementary school practice was conducted by Chapman and Feeler (1917) to determine the effect of external incentive on rate of improvement in performance of school work. Assuming the close relation between interest and effort, two methods were employed,—the direct appeal to the subject’s interest by showing its close relation to the desired activity, and the indirect or borrowed appeal of rewards and incentives external to the process itself. A group of thirty-six fifth grade boys and girls

<sup>1</sup> *Pedagogical Seminary*, VI:314–371.

<sup>2</sup> *Journal of Educational Psychology*, VIII:469–474.

<sup>3</sup> *School and Society*, V:178.

was divided and tested for nine successive days by Thorndike's simple addition test (ten minutes), Woodworth and Wells' cancellation test (one minute), and in substituting figures for numerals (five minutes). Incentive and stimulation were applied as follows:

GROUP A.	GROUP B.
(In addition to B.)	(No stimulation except)
<ol style="list-style-type: none"> <li>1. Each pupil's results published for previous day.</li> <li>2. Point marked in blue of previous day's performance.</li> <li>3. General improvement of class shown by graph.</li> <li>4. Credits given in form of stars for improvement from last record and for position in class. Prizes promised at end of ten periods to fifty per cent who had most stars for efficiency and improvement.</li> </ol>	<ol style="list-style-type: none"> <li>1. Informed of errors in addition.</li> <li>2. Novelty of test.</li> <li>3. Interest in work itself.</li> <li>4. Same conditions as those of serious school work.</li> </ol>

The results, which are shown graphically, are somewhat impressive. The rate of improvement of the two groups varies directly with the length of the practice period in each operation. By the ninth period the motivated group stood ten points higher than the unmotivated, the points being awarded for each correct operation and subtracted for those incorrect. The diagnosis of individual interest responsive to such direct appeal and the standardization of the stimulus is clearly a study of the first importance.

While of no immediate significance in point of method, Thorndike's current investigation to establish a correlation between interest and ability may inspire effort to determine the causes for the variation<sup>1</sup> which will then offer an approach to the quantitative description of interest in terms of relatively measurable determinants. The remark seems almost superfluous that no affective state can be recognized objectively except by the inevitable movements accompanying it, between which and the state itself, in a given instance, the subject cannot distinguish any constant correlation.

<sup>1</sup> As will later appear, the compensating interest in deficiencies is probably constant and so would tend to reduce the correlation suggested by Thorndike as eighty-nine per cent. This wider variation, if established, must then be seriously investigated. But see Thorndike, *Educational Psychology*, III:360ff. for view of compensation consistent with the above text.

From the replies of 344 college students to a questionnaire calling for an indication of both interest and ability in the various studies in the last three years of elementary school, in high school, and in college,—the following ratios are computed:

	RESULTS FROM 344 INDIVIDUALS	PREVIOUS RESULTS FROM 100 INDIVIDUALS
<i>Permanence of Interests</i>		
Elementary school interest with high school interest....	$r = .85$	
Elementary school interest with college interest.....	$r = .66$	.66
High school interest with college interest.....	$r = .79$	
<i>Permanence of Abilities</i>		
Elementary school ability with high school ability.....	$r = .83$	
Elementary school ability with college ability.....	$r = .71$	.66
High school ability with college ability.....	$r = .66$	.6
<i>Resemblance of an Individual's Order of Interest to his Order of Abilities</i>		
In last 3 years of elementary school.....	$r = .89$	.89
In high school.....	$r = .89$	.89
In college.....	$r = .89$	.89

After making allowance for error, the author concludes "On the whole I believe that the correlations given above are approximately what an omniscient observer of these persons would have found. . . . As another case of special interest in practice we may take the significance of the reports of relative *interest* at 11-14, for relative ability at 21 or later, commonly later." This latter possibility certainly offers sufficient incentive to improve the methods by which real interests may be diagnosed more specifically to indicate promise, if it be established that their correlations with measureable abilities are low.

This hasty survey of sources should suggest the wide variety of approaches to the study and something of the relative and particular value of each type of material.

4. *Method of Procedure.*—The study to be outlined is based upon a three fold division of subject matter. There are other reasons for this division than that of mere convenience. Employing the familiar distinction between teaching, instruction, and education which identifies teaching with skill-training, instruction with the organization of knowledge by habit, and education with the modification of character



by the addition of ideals to the foregoing, we have a basis, largely hypothetical no doubt, for distinction between aspects of the process. Such distinction is further supported by the "three levels" of neural development. The concomitant activities of these are somewhat in agreement with the interests characteristic of each period as expressed in favorite amusements, etc., which, are assigned roughly to the mental ages birth to six, six to nine, and nine to fourteen. Still further it is convenient to group the data under the physiological, the biological and the sociological interpretations so as to furnish loosely corresponding treatments of (I) interest as a state of consciousness, (II) of its development in universal forms of expression, and (III) of the modifications in its expression hitherto regarded as instinctive which result from social contact. While it needs to be emphasized that development of interest like that of all mental traits is gradual and that distinct periods of growth in the various factors do not synchronize at the three stages in one individual, still it is believed that the theoretical analysis is in sufficiently close agreement with biological law to justify this plan of procedure.

5. *Scope and Definition of Terms.*—In order that the account may be as inclusive as possible, the term interest is interpreted in its literal sense to include all media of correspondence between the mind and the object, real or imaginary, of its contemplation. Subtracting thought and action from the course of experience, interest is what remains. Hence interest implies the emotional accompaniment of every attentive state without regard to the quality or intensity of the emotional tone. While this catholic and somewhat technical use of the term is partly restricted and partly justified as the discussion proceeds, it is believed that no other can be strictly in keeping with the purpose of the inquiry.

To prevent analysis in vacuo, certain hypotheses are here suggested in anticipation of their later development. It is important that some understanding be reached at the outset concerning the relation of interest to mental experience as such and to other phenomena of which it forms a part.

Assuming interest to lie entirely within the limits of the affective process by which knowledge and action are determined,<sup>1</sup> one may

<sup>1</sup> For authority in the same general terms cf. J. Jastrow, "What men do depends upon what they believe, and how they feel," "The Psychology of Conviction," p. 7, and also "Fundamentally beliefs are formed and held because they satisfy." *Ibid* p. 5.

first consider the relation of interest to feeling in general. Reduced to its simplest terms, the process of development begins with certain specific reactions to appropriate stimuli which the organism is pre-natally disposed to feel. At this stage the affect forms practically the whole of experience which results from tendencies to experiment with various stimuli. At a later stage, when present feeling is modified by the results of former feeling, experience is determined by both. Interest, by hypothesis, is determined by the results of former feeling, *i.e.*, by experience. It should be noted that here such past experience is useful for merely specific ends. Organized response to a particular set of stimuli is not adapted to a different but similar set.<sup>1</sup> At a still later stage previous experience is so organized that reactions to usual situations are made with maximum ease and minimum feeling. Unusual situations are recognized as such and graded with respect to the intensity of the emotional response required. Such intensity is determined by the now habitual interests of the individual experience. Thus the inverse ratio of feeling and organized knowledge varies between pure feeling and complete knowledge. From this it may be observed that interest includes those elements of present feeling which combined with organic tendencies and associated elements of past feeling may be understood to determine the intensity, direction, and persistence of each attentive state. The investigation is then, in a sense, to analyze and explain these determinants with reference to successive periods of growth.

In order to identify forms of behavior resulting from these organic tendencies rather than from associated elements of past feeling, the distinction between interest and instinct deserves brief comment. It is clear that such distinction must be arbitrary since the functions of both overlap so considerably in any given experience. *Essentially the criterion is the degree to which the course of reaction is perfected.* Hence acquired instincts differ from organic instincts simply in that the latter direct the course of seeking without reference to previous experience. The development is therefore from instinct through interest to acquired instinct. This notion may serve here to avoid the con-

<sup>1</sup> Thus the boy who is first reduced to tears by the sight of his brother's chastisement and later by the mental picture of Simon Legree's lash across the back of Uncle Tom, has failed so to relate knowledge with feeling that a recurrence of the generic situation will provoke the same response—desire to avert suffering, perhaps—with decreased intensity of feeling.



fusion which must otherwise exist between so-called "special" interests and acquired instincts.<sup>1</sup>

It is desirable to make another distinction here for future reference. Both feeling and interest imply pleasure-pain, satisfaction and dissatisfaction, etc., as resulting from any situation toward which attention is directed. Both should however be distinguished from thought of such situation. The object as it is set before us, we think; the manner in which it affects us, we feel. Therefore by our interest in the object we refer to our attitude toward it, and we may think of this attitude as well as of the objective qualities. Interest in the object may be spoken of as a quality of the object and so included in our thought of it. A cheerful fire is thought of as a kind of fire that makes the beholder cheerful. Hence interest is often, yet not always, included in thought of a particular situation, but thought is not properly included in the interest.<sup>2</sup>

This distinction between interest in the object and interest in the thought of it is useful in defining what is referred to throughout as *type of interest*. By analogy with memory the question is often asked; there is interest, but are there interests?<sup>3</sup> The answer depends of course upon whether interest is considered as potential or as expressed in various situations. In the latter case it is evident that previous experience with a similar situation determines the subject's attitude both to the situation itself and to the thought of it. There is then a logical basis for a theoretical classification of such attitudes by types of experience. Furthermore since certain types of interest as distinguished by such attitudes are characteristic of each individual and so greatly affect his interpretation of environment, the discovery of the appropriate type and a knowledge of its limitations is the theoretical prerequisite of effective motivation. As distinguished in the analysis to follow the types are three: an intrinsic, which seeks

<sup>1</sup> This distinction is regularly ignored in popular studies of "the collective instinct," "the travel instinct," etc., and becomes tenuous as regards imitation, gregariousness, curiosity, et al.

<sup>2</sup> For elaboration of this distinction which is most important in educational practice and for the study of correlations between interest, knowledge and abilities, see W. Mitchell, *op. cit.*, pp. 64-65. The investigations of J. M. Cattell and others have established the fact that attention to an entirely uninteresting object is seldom longer than a minute's duration. This does not invalidate the above distinction.

<sup>3</sup> e.g., G. E. St. John: Children's Interests. *Child Study Monthly*, 3: pp. 284-286.



indulgence of feeling toward the situation; practical, which seeks usefulness, or directs action towards the situation; and cognitive, which seeks meaning.<sup>1</sup> Each of these types is conceived to be differentiated by socialized expression so as later to bring certain elements into prominence that are comparatively negligible during infancy.

For further assistance in classifying interest in particular forms of activity the term *variety of interest* has been accepted as somewhat synonymous with "special interests" as the latter term is popularly used. There is, however, the difference that the variety of interest applies to that common quality of certain objects or activities which explains the subject's attitude toward them, in the sense that the attitude can only be known objectively as it is combined with thought of the object and so regarded as a quality.<sup>2</sup> "Special" interests are usually identified with the chosen activities themselves. While certain elementary varieties may occur in any type, those appearing later tend to find expression in appropriate types; though since the pure type probably exists only in abstraction, the truth of this statement depends largely upon the specific case.

It is recognized that without copious illustration, which space does not permit, the formal statements and diagrams of such general principles as the above may tend to obscure the facts they are intended to organize. It should therefore be emphasized at this point that the principles hereafter outlined are valueless except as applied to the specific situation. The situation can never be applied to the formula without danger of aeroplaning.

6. *Problems Excluded from the Discussion.*—(a) No attempt will be made to justify the theory of the concomitant development of

<sup>1</sup> After W. Mitchell, *loc. cit.* In general, the agreement among authorities in different fields upon this logical classification of interests is surprisingly close. Following Herbert's three-fold classification under the two divisions of "knowledge" and "participation," others who have employed substantially the same terms as the above are W. H. Kilpatrick: *The Problem-project Attack in Organizing Subject-matter and Teaching*, *N. E. A. Proceedings*, 1918, pp. 528ff.; J. Dewey: "Interest and Effort," Chapter IV; W. McDougall: "An Introduction to Social Psychology," p. 26; C. R. Henderson: "Principles of Education," p. 389; N. M. Butler: "Meaning of Education," p. 17, who distinguishes religious and literary from the purely intrinsic type; J. Welton: "Psychology of Education," p. 198; and P. Sandiford: "The Mental and Physical Life of School Children," p. 224.

<sup>2</sup> Hence novelty, interest, repetition and movement as well as the acquired instincts, curiosity, imitation, et al, are discussed as varieties of interest, since all serve to explain the expression of interest in particular as against the general expression distinguished by the type.

mental traits, the general validity of which, in contrast to the theory of periodic development, is assumed. This applies likewise to the rejection of saltatory development at adolescence. Without such reservations the enforced plan of discussion would superficially imply abrupt transition between stages of interest and the periodic appearance of varieties of interest.

(b) The theoretical nature of the discussion focusses attention upon the phenomena of interest as observable in groups. This should not lead to the assumption that individual differences are ignored which is one purpose of the study to explain. The first step in motivation consists in determining the varieties of interest in which expression is temporarily most intense and thereafter in such instruction as will evoke expression in useful content as the result of voluntary effort of attention. The principles derived from groups presuppose such individual study for their application.

(c) The question of the relation between coercion and appeal to direct interest is excluded on the grounds that the situation should determine the practice. The effects of coercion upon expression of interest are briefly treated.

*(To be continued)*

# SOLUTION OF PROBLEMS IN GEOMETRY

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It is maintained by many that one of the chief factors in the solution of problems in geometry is the ability to visualize clearly and vividly the figure that will satisfy the conditions of the problem. To discover the extent to which visualization enters into such solutions, to determine the precise manner in which visualization functions, and to ascertain what other differences in behavior are found between those who excel in geometry and those who do poorly in it, were the purposes that animated the present investigation.

As a part of another study the Stockard-Bell tests in plane geometry were given to one hundred and forty-two freshmen students in the department of education of the University of Texas. The scores of these students ranged from 5 to 46 out of a possible maximum of 70. Assuming that these tests afford a reasonably accurate indication of attainments in geometry, the range of scores was wide enough to justify the conclusion that those having the higher scores might well be called "good" geometry students, while those at the bottom of the list would qualify as "poor" geometry students. Our intention was to take the highest five and the lowest five for intensive study, but for various reasons it was found impossible to secure for the experimental study those who stood at the very bottom of the list. The students ultimately available were the following.

Good group			Poor group		
Student	Age	Score	Student	Age	Score
GU.....	17.0	46	PD.....	21.0	20
GV.....	17.0	38	PA.....	20.0	11
GY.....	17.0	45	PB.....	18.0	14
GZ.....	18.0	28	PC.....	19.0	12
GX.....	19.0	34	PE.....	19.0	13
GW.....	19.0	30			
	—	—		—	—
Average.....	17.8	37		19.4	14



It will be seen that while the average score of the good group is almost three times that of the poor group, the average age of the latter is almost two years higher than that of the former. This is quite in accord with other studies on elementary and high school pupils, and supports the generalization that in a given group classified by ordinary school progress the duller pupils are apt to be the older and the brighter pupils the younger. All the students participating in the experiment were girls.

#### THE TESTS

The material selected for the experimental work consisted of four exercises in plane geometry. Exercises I and III presented locus problems, Exercise II is the famous Binet test of the results of a wedge-shaped cut on the edge of a folded paper, and Exercise IV was one involving a simple geometrical construction. Exercise II was included because it appeals to what is traditionally called visual imagery, and because it was found by Kelley<sup>1</sup> to be more highly correlated with geometrical ability than any other test used in his analysis. The other three exercises were designed to afford room for original reasoning, and at the same time to enable the experimenter to observe the behavior of the subjects and to judge of their method of attack.

It soon became apparent that these exercises were too difficult for even the best students to perform independently. Since, however, the object of the study was not the mere performance of the tasks, but rather the analysis of the student's methods of attack, the difficulty of the exercises helped rather than hindered the attainment of the desired goal. If the problems had been such that the subjects could grasp their solution at a flash, the experimenter would have had to rely entirely on the introspective reports of inexperienced observers. Such introspection is apt to be quite untrustworthy. But where the subject has to halt and think carefully, it not only renders him more amenable to the questions of the experimenter, but also enables the latter to make a better comparison of the attitudes, habits of attention, persistence, certainty, etc., of the good and the poor groups. A list of suggestions was prepared for each exercise, to be given only when it had become apparent that the

<sup>1</sup>Truman Lee Kelley: *Educational Guidance: An Experimental Study in the Analysis and Prediction of Ability in High School Pupils*. *Teachers College Contributions to Education*, No. 71, 1914, p. 22.

student could go no further without help. The suggestions were arranged in such a way as to indicate by their efficacy something of the nature of the processes going on in the mind of the subject. They consisted of three groups, the first appealing to pure reason, the second to concrete imagery, and the third to immediate sensory experience or objective experiment. In this way the number of suggestions given furnished a significant index to the mental reactions of the subject.

### THE DIRECTIONS

#### *Exercise I*

"In this exercise, which consists of a problem in plane geometry, and which I shall presently read, you are to solve the problem mentally, without using paper and pencil and without moving your hands. The problem will be read through twice, then you will be allowed two minutes in which to study it. You are not expected to solve it in two minutes: it will not be easy, but neither will it be excessively difficult. At the end of two minutes, you will be asked certain questions which you will answer as clearly and concisely as you can without moving your hands; *i.e.*, if you speak of a vertical line, do not move your hand up and down, or if you speak of a horizontal line, do not move the hand back and forth. Work as rapidly as you can, but do not hurry: think first, then speak. You must not use pencil and paper in any problem except when specifically directed. Do not ask any questions during your two-minute study period; in general, do not ask questions on any problem except when you are told to do so. Do not grow impatient if you desire to ask a question, as you will be given ample opportunity in due time. If you misunderstand anything, or forget something, do not ask questions; try to think it out by yourself, try to remember it without help, then whether you have succeeded or not, answer all questions as correctly and clearly as you can. We want to know what you think about the problem and how you think it, whether you solve it or not. Here is the problem. I shall read it through twice, and after two minutes, I shall ask you some questions which you will answer without moving your hands:"

"A straight line AB moves so that it remains parallel to a given straight line XY, and touches at one end a given circumference. Find the locus of the other end."

These instructions in their entirety were read to each subject that took problem I. The purpose of the instructions is sufficiently obvious without explanation; the main thing to notice is that they were uniform, as were also the questions and suggestions following the presentation of the problem. All the suggestions were given in the order above indicated until the subject succeeded in solving the problem.

#### QUESTIONS AND SUGGESTIONS

1. Repeat the problem just as it was read to you.
2. What is the locus of the other end?
3. How did you arrive at this conclusion?
4. Have you a picture in your mind of the figure as it would appear on paper?
5. Are the lines in your picture clear, can you see them plainly?
6. Describe your figure just as you see it in your mind.
7. Move your line AB so that the end touching the circumference is about 90 degrees from the starting point. Move it an equal amount twice more in the same manner.
8. Connect the points where the other end of the line has been.
9. How many sides has the figure thus formed? Is it regular?
10. What difference would there have been in the figure had you moved the line only 45 degrees at a time? and seven times?
11. Therefore, what limit would the shape of your figure approach as you lessened the distance you move AB each time? What kind of a line does the other end of AB generate as you move it under the given conditions?
12. Draw your figure on paper, using compass, ruler, and protractor.  
(The examiner should here repeat the questions above beginning with 7 until the subject succeeds.)
13. (If the subject still fails to respond correctly, the examiner must go through an objective demonstration; but when this has been required, the student's reaction has been counted as a complete failure to solve the problem.)

We have said that the suggestions were arranged in groups. While the arrangement may seem at first sight arbitrary, it is not entirely so. Suggestions (7) to (11) inclusive plainly appeal to pure reason primarily. Hence, if a subject solves the problem with the aid of the 11th suggestion, he may be said to have succeeded with the use of pure reason alone. But if the 12th is required, it has been counted as due to a concrete suggestion. And if nothing but the 13th has availed, the solution has been accounted a failure, and the most effective suggestion as objective experiment.

#### Exercise II

"In this exercise you will use this square piece of paper. I have here another piece of paper, of exactly the same shape and size. I



am going to fold it a certain way, which you will notice carefully, and then I am going to cut out a piece while it is yet folded. Your problem is to find the exact appearance of my piece of paper when I unfold it. You will indicate your conclusions by drawing on your piece of paper the shape and position of the cuts as you think they will appear on my paper. Do not ask any questions until told to do so. Keep your hands still while the paper is being cut, and do not raise your paper from the table in front of you, nor in any way move it while solving the problem. Here is your problem:"

The experimenter places the square piece of paper with its sides vertical in full view of the subject. He folds it along the diagonal from the right upper to the lower left hand corner (as the experimenter faces the paper), so that the vertex of the lower right coincides with the vertex of the upper left hand corner. He folds along the other diagonal so that the lower left vertex coincides with the upper right vertex, and the left side coincides with the upper base; he folds along the vertical median so that the top base will be folded back over itself to the left, and the two diagonals will coincide throughout; now, beginning at the edge formed by the fold along the vertical median he cuts with the scissors in a line parallel to the bases about one and one-half inches, and from the end of this cut he cuts back to the median along a line parallel to the diagonals (the excised portion will thus represent a right isosceles); as soon as the cut is made he exposes it for three seconds, and lets the subject study it for two minutes.

#### QUESTIONS AND SUGGESTIONS

1. "Without folding your paper, explain in detail how you have obtained your result. Tell me exactly how I folded and cut my paper."
2. "You have made a slight oversight. I am going to tell you exactly how I folded and cut the paper, and see if you cannot detect your error." (The experimenter will here give the stimulus verbally as written out above.)
3. (If the subject still misses the point, the experimenter will give the verbal stimulus again, accompanied by actual folding of the paper, but without cutting it.)
4. (If the subject still fails, let him go through the motions himself, up to the actual cutting, but without unfolding the cut paper.)

#### *Exercise III*

"You will treat this problem exactly as you did the first one."  
(Read the instructions of problem I). "Here is your problem:"

"A straight rod AB moves so that its ends constantly touch

two other straight rods which are perpendicular to each other. Find the locus of its middle point."

### QUESTIONS AND SUGGESTIONS

1. Repeat the problem just as it was read to you.
2. What is the locus of its middle point?
3. Have you a picture of the figure in your mind?
4. Describe this picture. Are the lines clear?
5. The median upon the hypotenuse of a right triangle is equal to one-half the hypotenuse.
6. In this problem we have a right triangle whose legs are variable but whose hypotenuse =  $K$ . Therefore the median =  $K/2$ .
7. Of how many movements is  $AB$  capable under the given conditions?
8. Move  $AB$  as far as it will go one way and mark its middle point and move it to its limit the other way and again mark its mid-point. What is the distance from the right angle vertex to each of these points?
9. Mark similarly several intermediate positions of the mid-point.
10. How far is each of these from  $O$ ?
11. Does not each point with  $O$  determine the median of a right triangle whose hypotenuse is  $K$ ? From (5) above what is the relative length of these medians?
12. Draw the figure. (The experimenter will now give the suggestions over again from (5).)
13. If the subject fails, give an objective demonstration, showing the relation to a ladder, etc.

### Exercise IV

#### GIVE THE SAME DIRECTIONS AS IN EXERCISE I

Through a given point  $P$  between the sides of a given angle  $ABC$ , draw a line terminated by the sides of the angle and bisected at  $P$ .

### QUESTIONS AND SUGGESTIONS

1. Repeat the problem as it was read to you.
2. What is your solution?
3. Have you a picture in your mind of the figure?
4. Describe this picture.
5. The line joining the middle points of two sides of a triangle is parallel to the third side and equal to one-half of it.
6. Suppose you have found the line. Then this line with the sides of the angle  $ABC$  makes a triangle, and its middle point is  $P$ .
7. Through  $P$  pass a line parallel to the lower side of the triangle.
8. How does this line divide the third side of the triangle?
9. What is the relation of the distance from this intersection to the vertex at  $B$  to the length of the whole intersected side?
10. Draw the figure carefully. (The experimenter will now repeat the suggestions above beginning with (6), until the subject succeeds.)



## THE RESULTS

Some of the results obtained in this study require special explanation; and the method of their determination must be kept clearly in mind if they are to be correctly interpreted. In the first place, the term Memory indicates immediate recall, and was graded arbitrarily as follows: if the subject was able to answer question (1) at the first trial in a satisfactory manner, he was graded 100; satisfactory here meaning simply a correct statement of the problem, not necessarily verbatim. If the subject failed on the first trial, the experimenter read the problem again twice through just as the first time, allowed two minutes, then asked again question (1); if the student failed on this second trial, he was graded 75. If the subject required three trials, he was graded 50; if four, 25; if more than four, 0.

Under the term Behavior are included stability of imagery, facility of verbal expression, and inhibition of superfluous motor accompaniments. These are best illustrated by examples: GX, in the good group, in Exercise I, presented a striking case of very stable and clear mental images. When question (1) was put after the presentation of the problem, she gave a verbatim recall. When question (6) was put, GX fixed her vision on a certain part of the wall of the laboratory, and described her figure in faultless English just as though she were looking at a printed figure, and used letters without once confusing or misplacing them. It is to be noticed also that the clarity of GX's figure in no wise depended upon the external point of fixation. GX was asked to look at various objects and in every case her figures were as stable and clear as if she were looking at them on the blackboard. Such stability was graded 100. The grading of Verbal Expression for GX was equally easy. Her English was faultless and logical. Her verbal description of the figure was so clear and exact that any one could have reconstructed the figure from the first hearing. Her motor activities were well under control. The experimenter could not detect the slightest tendency to move any muscle except those of speech, and then only when speaking effectively. GX never left a word half spoken, nor used one incorrectly; but always thought out every word before hand.

On the other hand let us review the case of PD, in the poor group, in Exercise III. PD had images, but they had the serious fault of being entirely wrong. It took three presentations to enable her to recall unaided the words in which the problem was presented. A



remarkable thing was that each time PD was entirely confident that she was right, and was much surprised when told that she did not have the correct idea at all. When it came to the description of her figure, the experimenter was unable, even with the most exaggerated patience, to arrive at any definite conclusion as to just what the figure was. PD was profuse in confessing that she did not know herself just what she was trying to describe. The experimenter then described the proper figure and drilled her on it so that she could describe it independently with a certain degree of facility and accuracy. But no sooner was the work of solving begun than PD twisted her figure into a hopeless tangle. This lack of stability was given the grade 0. PD's English was very faulty and difficult to understand. Her verbal expressions consisted chiefly of timorous interjections, exclamations, and verbless and unfinished sentences. A mark of 25 seemed to represent fairly her proficiency in English expression. A striking thing about PD was her strong, uncontrollable motor tendencies. Contrary to directions, she immediately seized a pencil and began drawing lines as soon as the experimenter had presented a problem. This she continued to do in spite of repeated protests on the part of the experimenter.

Table I shows some rather interesting things. We see that the good group bests the poor group in memory by a score of 94 to 56, which is sufficient alone, if the scores are to be interpreted absolutely, to explain the difference in geometrical ability between the two groups. But it is in the second item that we find the most significant indications. According to the results here expressed, the so-called visual tendency appears to be only moderately more pronounced in the good group. The difference in ability to use good English is far greater, and, in the opinion of the authors, is intimately associated causally with the lack of stability and lack of clarity in the visual manifestations. Still more significant is the difference in scores for motor accompaniments. All but one of the good group were able to inhibit undesirable motor activities quite satisfactorily, while not one of the poor group showed the ability to do so. In the case of the good student GU we have to do with a high degree of automatic motor activity that scarcely reaches the threshold of consciousness. She was always scribbling, and frequently had no idea of what she had written. This motor activity was accompanied by a distinctly inferior type of verbal expression, and was characterized by a considerable number of incorrect solutions.

TABLE I

Subject	Exercise	Memory	Behavior			Effective suggestions			Number incorrect solutions	Final correct solution
			Stability of imaginary	Verbal expression	Motor accompaniments	Pure reason	Concrete imagery	Objective experiments		
I. Good group										
GU.....	I	100	100	50	100	...	100	...	2	1
	II	100	100	75	100	...	100	...	1	1
	III	100	100	75	100	...	...	100	2	1
	IV	100	100	75	50	...	100	...	2	1
GV.....	I	100	100	100	0	100	...	...	0	1
	II	100	100	100	0	100	...	...	1	1
	III	75	75	100	0	100	...	...	1	1
	IV									
GW.....	I	100	100	100	0	100	...	...	1	1
	II	100	0	100	0	...	100	...	1	1
	III	100	100	100	0	...	100	...	2	1
	IV									
GX.....	I	100	100	100	0	...	100	...	1	1
	II	100	100	100	0	100	...	...	0	1
	III	100	100	100	0	...	100	...	2	1
	IV	100	100	100	0	...	100	...	0	1
GY.....	I	100	100	100	0	...	100	...	1	1
	II	100	50	75	100	...	100	...	3	1
	III	25	100	100	0	...	100	...	2	1
	IV	100	100	80	0	...	100	...	0	1
GZ.....	I	100	100	100	0	...	...	100	0	1
	II	100	100	100	0	100	...	...	0	1
	III	100	100	100	0	...	100	...	2	1
	IV	75	100	100	0	...	100	...	1	1
Average.....		94	92	92	20	27	64	10	1.2	1
II. Poor group										
PA.....	I	50	100	50	100	...	...	100	2	0
	II	50	100	50	100	...	...	100	3	0
	III	50	100	50	50	...	...	100	2	0
	IV	0	100	0	100	...	...	100	5	0
PB.....	I	100	100	100	100	...	...	100	3	0
	II	50	100	100	100	...	...	100	3	0
	III	100	100	100	100	...	...	100	3	0
	IV	100	100	75	100	...	...	100	4	0
PC.....	I	0	100	0	100	...	...	100	5	0
	II	100	100	25	100	...	...	100	1	1
	III	100	100	75	100	...	...	100	2	1
	IV	100	100	50	100	...	...	100	2	0
PD.....	I	50	100	0	100	...	...	100	2	0
	II	25	0	25	100	...	...	100	2	0
	III	25	0	25	100	...	...	100	0	0
	IV	75	75	0	100	...	...	100	2	0
PE.....	I	0	80	0	100	...	...	100	4	0
	II	25	0	25	100	...	...	100	2	1
	III									
	IV									
Average.....	...	56	75	42	97	...	...	100	2.6	17

On the whole it seems evident that the good students were able to inhibit their motor activities much better than the poor ones. Is this due to the greater motility of the poor students, and the lack of it among the good ones? From other observations it seems likely that there is little difference between the two groups in general motor tendencies, but rather that the good students remembered the directions and consciously suppressed tendencies to movement, while the poor group forgot all about them.

The results for the rubric Effective Suggestions seems to support this idea, especially with reference to the matter of breadth of attention and strength of memory. The poor group were not helped by the Pure Reason Suggestions nor by the Concrete Imagery, because they could not remember what was said. Probably this fault of memory was largely due to a lack of concentration on the matter in hand, to an inability to fasten the attention on the essential things, and therefore the inability to make fundamental logical associations. Without these, memory does not go very far and amounts to little as a factor in reasoning. But a weak and faulty attention works both ways; for in addition to making logical memory very problematical, it makes rote-memory useless. Suppose the subject has memorized a certain block of *logical* data in a more or less *rote*-fashion, as all the poor group memorized every thing they did memorize; now if the subject cannot fasten his attention on each essential in order long enough to examine accurately its full meaning and relations to the other elements of the problem, there is hardly a chance that he will 'bridge the gap' correctly. Hence we see that the poor group offered a multitude of incorrect solutions: these 'solutions' were only vague ideas which perhaps occurred to the good group as often and as incorrectly as to the poor group. The difference was that the good students had developed such a neural organization — had such a group of associations already formed that they immediately rejected these irrelevant ideas and sought for something more closely related to the conditions of the problem. This neural organization, this readiness to lay hold on the significant features of a situation and reject the irrelevant ones, seems to depend upon native tendencies that are far-reaching, and that have been built into life habits of accurately noting and recalling details, of care and precision in the use of language, and of conscious control of motor activities. Unless these life habits are already well formed, the prospect of developing a good geometer is not a very favorable



one. To what extent these life habits are developed by the study of formal geometry would be an interesting problem for experimental investigation.

The most striking difference revealed by the table is that in every case the good group reached a final correct solution, while in only three cases out of eighteen was this true of the poor group. Thus, so far as these exercises give any indication, the Stockard-Bell tests enabled us to select two groups, the one of which was distinctly superior, the other distinctly inferior, in geometrical ability.

#### CONCLUSIONS

1. Excellence in memory (for immediate recall) is very highly correlated with geometrical ability.

2. There was less observable difference in the quantity and quality of visual imagery than in any of the other elements compared; but the difference was in favor of the good group.

3. Excellence in verbal expression is very significantly related to ability in geometry.

4. Motor manifestations are exceedingly prominent in the poor group, and almost entirely absent in the good group. This may be due either to differences in motor tendencies, or differences in ability to control equally strong tendencies.

5. The poor group depend almost wholly on objective stimuli, and were most helped by objective suggestions.

6. The better memory of the good group may depend much on comprehension, but it seems closely related to more highly organized habits of neutral control.

7. The results of this study, in so far as they apply, show the efficacy of the Stockard-Bell Tests.

# SUPERIOR CHILDREN—THEIR SCHOOL PROGRESS

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More and more the educational world is considering the needs of especially bright children. From many sources comes the assertion that whereas subnormal children are given training adapted to their needs in special classes, the supernormal child is not sufficiently studied. We are told that unless these clever children who are to be the intellectual leaders of the next generation are given work of a sort commensurate with their ability they are going to form indolent habits, their minds never working at full speed are going to become dull, and their promise remain forever unfulfilled. Furthermore it appears that in very few cases are these children graded in school where their ability would warrant. Even when an especially bright child is found to be the youngest in his class by several years, nevertheless a mental test reveals the fact that he is still two or three years lower than he should be. Obviously, so we are told, his mind is being untrained and his time wasted.

Enough has been said to rouse a considerable number of school authorities to action. Now most of our cities make some provision for the rapid promotion of their more gifted children.

The practical plans so far adopted for ministering to the needs of the bright child are based almost entirely upon the assumption that getting educated means covering certain ground—

- e.g.* Work with integers, fractions, decimals, percentage, etc.
- Use of period, comma, apostrophe, quotation marks, etc.
- Identification of noun, adjective, verb, etc.
- History of the United States from page 1 to the end.
- Geographical facts about one continent after another, etc.

Now in up-to-date parlance a bright child is a child with a high I.Q. This means that while living in the world a certain number of years he has attained the mental level of the average child who has lived a much longer period. Having this higher mental level it appears natural that he should be able to run swiftly along the educational road described above, while the average child walks sedately and the dull child plods painfully. Thus he may reach the decimal milestone and recognize verb-phrases while the child of lower I.Q. is just passing integers or approaching adjectives. Miss Elizabeth Irwin, who

has tested many hundreds of children in the New York public schools, states that a child with an I.Q. of 90 can frequently go through the public school curriculum grade by grade without repetition. Therefore with the same curriculum there is no way to provide for those with higher I.Q.'s except to get them over the ground more rapidly. It therefore appears that many children might and should be prepared for high school at the age of twelve and for college at fifteen, a result regarded as obviously desirable.

Probably the most usual method of attaining this short cut is to test the child "scientifically" and place him in a class with children whose average mental age corresponds with his. Of course this arrangement quite ignores character and emotional differences due to physical maturity or lack of it. Intellect is regarded as the determining factor and no difficulty is anticipated from placing the clever baby of ten with an I.Q. of 150 in a class with average 15 year old adolescent pupils.

A more discriminating method classes together children of the same life age and I.Q.'s very nearly equal, for example we find grouped in one room ten year old children with I.Q.'s 140 or 150, that is with a mental age of fourteen or fifteen years, thus approximating equality of mental ability without the discrepancies introduced by combining preadolescent and adolescent pupils. Implicit in this last method are two corollaries. The first of these is that the highly intellectual should be educated only with their own kind. This the writer challenges. With no opportunity in childhood to seek common ground with those of lower mental ability, how, in later life, are they going to have a wise and sympathetic understanding of and insight into the motives and mental processes of the average men and women whom they are being educated to "lead"?

The second corollary is that all high I.Q.'s approximate similar intellectual ability. This also the writer challenges. After we have averaged a 12 year old Ball and Field test, the 14 year Problems, 16 year Code, and 18 year Ingenuity test in one case, with a 12 year Vocabulary, 16 year old Fable Interpretation and Code, and 18 year Digits in another case, together with sufficient minuses and pluses to give in each case a 15 year old mental level, how can we assume an homogeneous mental grasp on all school work? When superior children have been studied more closely we may learn that the farther they rank above the average the greater their divergence from each other.



The writer has unusual opportunity to study exceptionally bright children, and for several years has been pursuing this study with more and more definite purpose. Not only is the school in which she teaches one of very high standards, so that those of low mentality are automatically eliminated, but since it has been known that she was giving attention to this problem, a number of especially high I.Q.'s have been sent to her Department for that reason. At the present time out of 70 children under her care one has an I.Q. of 170, four are 160, several are near 150, and 140 is fairly common. Before discussing individual cases, however, it is necessary to compare the average mental ability of the pupils in this school with that of the public school population.

The Ethical Culture School of New York City strives to be consistently democratic. While the tuition rate places it among the most expensive schools of the city, it is required to have one third of its pupils free or enough pupils paying only partial tuition to equal one third free. No discrimination is made for race, color, religion, or economic status of the parents. The only requisites for entrance and retention of place are high moral character and mental ability to meet our very rigorous requirements. Sufficient mental testing has been done throughout the school to make it possible to state with fair definiteness the degree of intelligence thus measured which is necessary to cope with our conditions.

Last spring the Army Alpha tests were given to our entire high school. 98 per cent of the 209 pupils made a score of 90 or above, thus placing them above 14 years mental age. It must be remembered that only 30 per cent of the 1,700,000 drafted men in our cantonments attained this score.

362 tests with the Stanford revision of the Binet scale have been given in the last five years to children of the elementary grades. 174 of these were given by the writer, the remainder by other teachers in the school or by outside examiners employed for the purpose. These include children of every grade, except the Fourth, from the First to the Seventh, 295 of the cases being in the Fifth, Sixth, or Seventh grades. The median I.Q. is found to be 120. That is 50 per cent of our children have I.Q.'s above 120, whereas according to Terman only 10 per cent of public school children are above 120.

Experience has taught us that children with I.Q.'s near 100 will not be likely to retain their places in the school for more than a year or two, and has taught us to look doubtfully at anything below

110. This work has been going on so short a time that many of the children tested are still in the lower grades and therefore no reliable data can be compiled regarding the ultimate disposal of I.Q.'s of various groups.

The following classification indicates roughly the present situation of the children tested by the author in the last five years.

52 cases I.Q. 90-110.

- 52 per cent dropped by end of second year of high school, mostly by end of Seventh grade.
- 15 per cent moved away.
- 33 per cent still in school, but of these 47 per cent are unsatisfactory in their work.

36 cases I.Q. 110-120.

- 14 per cent have been dropped.
- 19 per cent moved away.
- 67 per cent are still in school and only two of these have ever been questioned.

62 cases I.Q. 120-140

- 10 per cent of these have been dropped.
- 11 per cent moved away.
- 74 per cent are still in school, apparently making satisfactory progress.

24 cases above 140 I.Q.

- 8 per cent dropped.
- 17 per cent moved away.
- 75 per cent still in school, apparently making satisfactory progress.

Many of our children are psychopathic and their tests accordingly more variable than the average. Nevertheless surprising stability in I.Q.'s is revealed by retesting. The Pearson coefficient of correlation of I.Q.'s in 82 cases retested after one year is .82. In 116 retests made in periods varying from a few months to 3 years, 75 per cent of the I.Q.'s were not altered more than 10 points. Therefore despite the skepticism of some critics, the tests are obviously a useful guide in predicting the probable continuance of a child in the school.

Continuing the investigation of our personnel I find that grade by grade the ages of our children do not differ greatly from those assigned as normal medians. In certain grades selected for the calculation because their mental tests were available for other comparisons, the relation was as follows:

	Normal age, years	E. C. S. age
Grade I.....	6.5	6.6
Grade II.....	7.5	7.67
Grade III.....	8.5	8.67
Grade V.....	10.5	11.0
Grade VI.....	11.5	12.2
Grade VII.....	12.5	12.6

With the life age of our pupils practically the same as is recognized as average for their respective grades in the schools of the country and the mental ages running higher than the average, one would naturally expect that our median scores in the standard pedagogical tests would be higher than the standard medians. Such has been found to be the case, although the results are frequently not so good in tests of speed and formal processes as of thought.

The results below were calculated for tests given to the 5th., 6th., and 7th. grades of my own Department last year. They are taken because fairly typical of such results in the school and because the mental ages and I.Q.'s of the same children for the same year are available and will be used later on. The figures indicate the number of years or fraction of a year that each grade is ahead (+) or behind (−) the standard it should have attained the preceding spring, the tests having been given within a few days after the opening of school in the fall, and no allowance being made for forgetting during the summer. For example, if the standard 5th. grade median score in a certain test was 20 and the standard 6th. grade median score was 30, and the E.C.S. 5th. median was 25, then that class would be .5 of a year advanced *i.e.*, + .5.

Courtis silent reading test

	Speed	Comprehension
Grade V.....	+2.67	+2.5
Grade VI.....	+4.00	+2.5

Kansas silent reading test

	Rate	Comprehension
Grade VI.....	+.8	+2.87
Grade VII.....	+.6	+2.33



## Hahn's geography test

Grade V.....	+ .37	(Our Gr. IV has very little geography as distinct from other subjects.)
Grade VI.....	+1.13	
Grade VII.....		Scale stops with Gr. VIII. but Gr. VII. was farther above Gr. VIII. standard than VI. standard median is above V. standard median. Perhaps we might count this score as +2 or +3 yrs.

Monroe reasoning tests.	Principle	Correct result
Grade V.....	+1.13	+1.23
Grade VI.....	+ .83	+1.2
Grade VII.....	+1.17	+1.08

## Monroe diagnostic arithmetic tests

	Rate	Accuracy
Grade V.....	- .41	+ .4
Grade VI.....	- .3	+ .6
Grade VII.....	+ .17	+2.3

Such results as these have been quoted to show not only the high type of pupil in schools of this sort but also the high grade of work done. It is interesting, however, to investigate to what extent these results are commensurate with the mental ability of the pupils. The normal age for the grades in question at midyear being respectively IV. 9.5 yrs., V. 10.5 yrs., VI. 11.5 yrs., VII. 12.5 yrs. (Page 6). If we add .5 of a year to ascertain approximately the life age of the same children in the spring we find it to be as follows,—Gr. IV. 10 yrs., Gr. V. 11 yrs., Gr. VI. 12 yrs., Gr. VII. 13 yrs. Using 120 as the median I.Q. and so calculating the spring mental ages of these grades we find them to be Gr. IV. 12 yrs., Gr. V. 13.2 yrs., Gr. VI. 14.4 yrs., Gr. VII. 15.6 yrs.

(By actual individual testing the mental ages last spring were found to be almost identical with these results, namely, Gr. V. 13.5, Gr. VI. 14.8, Gr. VII. 15.5).

In other words these children's mental age is in advance of their life age,—Gr. IV. 2 yrs., Gr. V. 2.2 yrs., Gr. VI. 2.4 yrs., Gr. VII. 2.6 yrs.

Now to return to the pedagogical tests, while Grade V. (using Gr. IV. rank for the preceding spring, although as a matter of fact the

mental age and corresponding ability to attack intellectual tasks was raised during the summer) was 2 yrs. above normal in mental age they were as follows in attainment,—

	Speed	Comprehension
Courtis silent reading test.....	+2.67	+2.5
Hahn geography test.....	+ .37	
	Principle	Correct result
Monroe reasoning tests.....	+1.13	+1.23
	Rate	Accuracy
Monroe diagnostic tests.....	- .41	+ .4

While Gr. VI. were advanced 2.2 yrs. in mental age their performance was as follows:

	Speed	Comprehension
Courtis silent reading test.....	+4	+2.5
	Speed	Comprehension
Kansas silent reading test.....	+ .8	+2.87
Hahn geography test.....	+1.13	
	Principle	Correct result
Monroe reasoning test.....	+ .83	+1.2
	Rate	Accuracy
Monroe diagnostic tests.....	+ .3	+ .6

Grade VII. advanced 2.4 yrs. in mental age made the following record:

	Rate	Comprehension
Kansas silent reading test.....	+ .6	+2.33
Hahn geography test.....	+2 or +3 yrs.	
	Principle	Correct result
Monroe reasoning test.....	+1.17	+1.08
	Rate	Accuracy
Monroe diagnostic tests.....	+ .17	+2.3

(These advancements in the pedagogical tests were calculated under the direction of Dr. W. A. McCall of Teachers College.)

With all allowance for error in interpreting these results it certainly appears at first sight either that these children are not being taught

with an efficiency proportionate to that given average children, or that school success is not so closely related to mental age as is commonly supposed.

One reply to the first alternative may be made at once,—that it is a matter of emphasis. As a school we give a smaller proportion of our time to the formal drill subjects which lend themselves to standard tests than do the public schools. Our “reading” is rather literary appreciation and widening of horizon. Our “English” is less formal grammar than the production of compositions of real literary value in both prose and poetry. Geography and history are taught by means of extensive projects involving independent research, wide collateral reading, comparison of authorities, and individual opinion. Mathematics means far less striving for speed and more the solution of problems, often those involved in real life situations. Experience has shown that it is not unusual for children failing to meet our requirements to prove themselves capable of attaining excellent results in public school classes.

But this alone does not explain the discrepancy noted above. We are led to believe that children of superior intelligence will excel the inferior either in formal or thought work, according to the sort of training to which they are subjected. In writing of very superior children (I.Q. 120—140) Terman says (*Measurement of Intelligence*, p. 96), “But wherever located, such children rarely get anything but the highest marks and the evidence goes to show that most of them could easily be prepared for high school by the age of 12 years.” Naturally this would not be expected in the case of a high school where the average ability was greatly above the normal, but it would certainly appear reasonable that the performance medians of these children should far exceed those of the average, and also that those children with higher I.Q.’s should exceed in performance those with I.Q.’s less high even though far above the average.

Undoubtedly these assumptions are true in the mass. But after considerable intensive work with very brilliant children I have found many individuals to whom they did not apply. There are many causes, some readily discernible, others quite inscrutable, which prevent their successful application to a large number of individual children. One longs for the opportunity to see John Stuart Mill, Macaulay, and other classic examples of brilliant children placed in a conventional class-room. Would their superiority have been manifest in their early years? Or suppose we could travel back over the



years and test Pasteur, Darwin, George Elliot, and other minds of superior intelligence in adult life, who were reckoned dull as children. Would their I.Q.'s not have been high?

Turning once more to the Ethical Culture School, it was found that out of 174 cases in the elementary grades (whole classes from Grade I. to Grade VII. being taken without selection) 68 cases or 39 per cent were accelerated in life age, that is they were younger than the normal age for the grade in which they were working. Every one of these 68 children had an I.Q. above 100. 165 or 95 per cent of the 174 cases had an I.Q. of 100 or above, but only 41 per cent of the 165 cases (68) were accelerated in life age. Stated briefly all of the advanced children were bright but less than half of the bright children were advanced.

In the writer's own department last year the difference between the median mental age of Grade V. and Grade VI. was 2.6 years, between Grade VI. and Grade VII. it was .6, yet the range in mental age within the grades was as follows,

Grade V. 6.5 yrs. (9.5 yrs.—17 yrs.)

Grade VI. 5 yrs. (12 yrs.—17 yrs.)

Grade VII. 5.5 yrs. (13 yrs.—18.5 yrs.)

This astounding range in mental ability was obvious to a large extent to every teacher working with these classes. All knew that the difference in breadth of view and depth of understanding was tremendous, just as we realize it to be between our acquaintances in many relations of life. Yet this grouping was the final adjustment of the year after the teachers had shifted with almost perfect freedom all cases where it seemed reasonable to suppose that more profitable school work would be achieved in a higher or lower grade.

Not only does this mean a tremendous over-lapping of mental age, but it would be erroneous to suppose that within a single grade those above and below the median mental age uniformly attain results in their work above and below the performance median of their own grade.

Let us again examine the results of the standard pedagogical tests. If we count the individual children who were above the class median in mental age and below the class median in performance, and also those who were below the class median in mental age but above in

performance, we can form a rough estimate of the lack of correlation between mental age and success in formal school attainment.

The table which follows should be read thus, 30 per cent of the children who took the Kansas Silent Reading Test were above their class median in mental age and below in rate, or below the class median in mental age and above in rate. 35 per cent were inconsistent in the same way in their comprehension score. 64 per cent of those taking the Courtis Reading Test were above the class median in mental age and below the class median in rate or below the median in mental age and above the median in rate.

	Rate	Comprehension
Kansas silent reading.....	30 per cent	35 per cent

(In Grade VI. the four lowest in rate were all above median in mental age.)

	Rate	Comprehension
Courtis silent reading. Gr. V. and VI.....	64 per cent	36 per cent
Thorndike visual vocabulary.....		44 per cent

	Rate	Principle	Correct result
Monroe reasoning test.	55 per cent	40 per cent	40 per cent

(In Grade VII. the highest child in rate and principle was lowest in M. A. and the lowest two in principle were second and sixth from the highest in mental age.)

Hahn's geography test.... 35 per cent

(Grade VII. the highest score was made by a girl who had the lowest mental age in the class and who was demoted within a month.)

	Rate	Accuracy
Monroe diagnostic arithmetic tests.....	46 per cent	48 per cent

This disparity is so great and so radically different from what one would be led to expect that I was impelled to pursue this line of investigation in a slightly different field.

Distribution tables were compiled to show the relation between the teacher's marks in each subject for a given class and the mental age, life age, and I.Q.'s respectively of the children of that class. In each case the Pearson coefficient was calculated. It was found that there was absolutely no significant correlation, the results being as follows:

## Correlations with school marks

	Mathematics			Manual work			Penmanship		
	Grade			Grade			Grade		
	V	VI	VII	V	VI	VII	V	VI	VII
M.A. ....	-.045	-.19	+.33	-.01	+.055	+.14	-.41	-.012	+.28
L.A. ....	+.13	.....	-.13	+.207	+.45	-.16	+.05	+.304	+.40
I.Q. ....	-.076	+.14	+.35	-.17	-.19	+.10	-.15	-.10	-.046
Cases. ....	19	18	22	18	19	21	19	19	22
	Composition			Spelling			History		
	Grade			Grade			Grade		
	V	VI	VII	V	VI	VII	V	VI	VII
M.A. ....	+.15	+.23	-.03	+.38	+.27	.00	.00	+.12	+.31
L.A. ....	+.04	+.08	-.55	+.15	-.09	-.38	+.04	-.12	-.29
I.Q. ....	+.12	+.16	+.24	+.29	+.19	+.29	+.02	+.18	+.46
Cases. ....	19	19	22	19	19	22	19	19	22

(These coefficients were calculated for me by a student under the direction of Dr. W. A. McCall of Teachers College.)

All this would seem to indicate that within a single grade mental age, life age, and I. Q. are not constant determining factors in affecting school marks. Other factors are at work different for almost every individual case. It is now my purpose to leave the group generalizations and examine certain individuals.

In the three classes of my department last year 32 children were below their respective class medians in mental age. A careful examination of their individual records reveals the fact that in a number of instances these children made a considerable number of scores above the class median in the standard pedagogical tests (page 12). One child, third from the lowest in her class in mental age was above her class median in all the tests. Several attained average marks from their teachers. A few were never conditioned or questioned in any subject. Several were recognized as especially good in formal work, and 16 were above their class median in penmanship. Nevertheless



there were no glaring misfits in this group. On the whole their work and play and general reaction on life were consistent with their being in the lower 50 per cent in a mental age ranking, including the little girl cited above who was above the median in all pedagogical tests and yet conspicuously lacking in thought power. 5 out of the 32 failed of promotion at the end of the year and 2 were dropped from the school. 4 were especially delicate in health.

Of the 32 cases above the class medians in mental age there were not many who did not present some peculiar problem during the year or who had not experienced some special difficulty earlier in their educational career. 17 were below the class median in penmanship, 5 of this number being so extremely poor in writing as to find this a handicap in all their work. They were unable to write more than a small proportion of what their class accomplished in a given period.

According to their teachers' rating something over a third were prominent for their so-called "laziness," that is they were recognized as never doing the best work of which they were capable, some of them manifesting no conscience whatever in the matter. About a third were especially frail in health. Half a dozen were keenly intellectual but saw no value in working things out to an accurate conclusion after the principle was grasped. They were inclined to be scornful of the less brilliant thorough worker. In some cases this natural tendency has seemed to us to have been accentuated by the exploitation of Rapid Advancement classes with their stamp of smug, self-satisfaction. As one such child said, "I'm pretty careless but I always know how to do things. Yes, I've always been told I was a very bright little girl. I've skipped grades twice." Half a dozen were either antagonistic or of pronounced immaturity in their grasp of social situations and responsibilities. For a combination of these reasons it was deemed necessary for five to repeat their grades and for three to be sent to other schools. It was curious to note that in two of the grades, the highest and lowest respectively in mental age failed of promotion or were sent elsewhere, while in the other grade the lowest two and the two just below the highest were eliminated or made to repeat. 8 out of the 32 would come under Terman's characterization of high I.Q.'s, that is they were so all round perfect in accomplishment that one would like to kidnap them. Nevertheless even out of this number 3 were extremely frail in health and in regard to the whole 8 any one of their teachers would say that they were no more likely to be prominent in adult life than many of the erratic children whose early school work is more difficult.

Of the 32 pupils below the median age 7 had I.Q.'s of 120 or above, that is they were at or above the median I.Q. of the School. This was because they were so young in life age that even with an I.Q. as high as 139 in one case the mental age was still below the median. On the other hand of those 32 above the median mental age only 3 had I.Q.'s. below 120.

The following are individual descriptions of children in the upper 50 per cent on a mental age ranking who seem to us to stand fairly well as type studies of superior children whom we have known:

1. Life Age: 10.4. Mental Age: 13.2. I.Q. 126

Below class median in Rate in Monroe Reasoning Test, Courtis Reading Comprehension score, Penmanship (Thorndike Scale). Above standard median in Height, Weight, and Grip.

A strange unsocial child, hovering about the teachers but not mingling with the children whom she was anxious to help but with whom she did not know how to "take hold." Ill a great deal. Did poor meagre work. Repeating grade this year and much improved in general attitude.

2. Life Age: 12.2. Mental Age: 15.9. I.Q. 131

Below class median in rate and principle of Monroe Reasoning Test, Hahn Geography Test, and Penmanship. Below average in weight and height, but above in grip.

A little girl who seemed to try but always did some strange freakish thing before the exercise was finished. Extremely nervous. Apparently not disliked but never has any real friends. Was promoted conditioned in Mathematics. She has gained considerably in self-confidence this year and is doing somewhat stronger work.

3. Life Age: 11.4. Mental Age: 16.4. I.Q. 144

Below median in penmanship and Courtis Reading rate. Above average in height and weight but below in grip.

A boy of brilliant mind who never did as well as he might because of sloppy, untidy papers, and inaccurate work. Hands almost useless. Could never see what difference a small mistake made if the principle was correct. All drill work for accuracy was irksome. Did not seem to know how to play with children. Fell into hysterical sobbing if teased or crossed in a game. No pronounced change this year except that his attendance is more irregular due to frequent colds and attacks of indigestion.

## 4. Life Age: 12.4 Mental Age: 17.3. I.Q. 140

Below median in everything except Hahn Geography and Rate score in Reasoning and Courtis Reading.

Physical Measurements not taken.

Boy. Dropped from School as failure both academic and social. Did not know how and apparently could not be taught how to try consistently.

Much disliked by his class mates.

## 5. Life Age: 12.8. Mental Age: 17.7. I.Q. 139

Below median in Monroe Reasoning Test Rate score but highest in correct result. Below in Penmanship.

Above average for age in height, weight, and grip.

A bright girl but unwilling to work. Extremely antisocial, seeming to delight in causing the unhappiness of others. Contradictory attitude.

A problem at home and at school.

## 6. Life Age: 11.25. Mental Age: 16.2. I.Q. 144

Below class median in Geography Standard Test and Penmanship.

Below average in Height, Weight, and Grip of both hands.

A very brilliant boy. Frail in health. Lacking sense of social values.

No interest in class government. Unable to meet practical situations.

Born an absent-minded professor.

When just eleven years old, started to paint bottom step of stairway first. Increasingly self-centered and brilliant this year.

## 7. Life Age: 14.3. Mental Age: 18.1. I.Q. 126

Below median in all scores of Monroe Reasoning Test.

Above average in Height, Weight, and Grip in both hands.

This boy showed excellent grasp of all subjects, including mathematics, but utterly refused to do any work, outside of class room stimulation.

A remarkable social leader although selfish and lacking in affection for anyone. Was put out of the school as an all round failure.

## 8. Life Age: 12.2. Mental Age: 16.25. I.Q. 134

Below median in all Standard Tests except Comprehension Score of Courtis Reading Test.



Above Life Age Average in all Physical Measurements.

Boy of very psychopathic inheritance. Always saw things at a different angle from other people and could not do them in the obvious way as taught. A great reader and original thinker. Upright character and high ideals but restive under any authority and therefore contradictory.

An interesting boy but very difficult to get over the grade requirements.

Much respected by the other children but never quite one of them. Greater poise and normality of thought this year.

9. Life Age: 11.5. Mental Age: 16.1. I.Q. 140

Below class median in Penmanship, Rate of Courtis Reading Test, and Principle in Monroe Reasoning Test.

Above Life Age Average in Physical Measurements.

A girl who seldom volunteered. Would sit out any number of periods in silence unless prodded. Good natured and kindly but indolent even in well doing. Conscientious but without ambition. Liked to please teachers but had absolutely no intellectual interest in work.

10. Life Age: 10.6. Mental Age: 17.2. I.Q. 162

Below class median in all pedagogical tests except Principle Score in Monroe Reasoning Test.

Above Life Age Average in Height, Weight, and Grip of both hands.

This boy was a problem in all directions. Left handed, wrote so slowly that only a few lines were finished in a period. Reading slow and labored. Got thought subjects only by having them presented directly by a teacher. Cared nothing for intellectual side of school life. The entire year was one of urging, tutoring, and checking up neglected tasks between home and School. He was not promoted. This year no improvement is apparent.

11. Life Age: 9.8. Mental Age: 15.6. I.Q. 159

Below class median in Penmanship and Geography, (due to slowness in writing as he is almost perfect in Geography). Lowest in class in Rate Score in Courtis Reading but 100 per cent in Comprehension.

Below Life Age Average in Height, Weight, and Grip.

A very remarkable little boy. Normal infancy. Virtually taught himself to read by three and a half years. When first brought to us was extremely nervous—restless—facial twitching—difficulty in

going to sleep at night. Had been forced from grade to grade in Rapid Advancement Classes. Entered our Fifth Grade a few weeks after eighth birthday. He was in the Sixth Grade last year. Remarkable in all thought work except History, excelling especially in Science. Good muscular control for his age but so much less than children of his class that he was relatively poor in penmanship, manual work, and games. Not anti-social, indeed a very loving spirit but that of a very little boy. Immature even for physical age, so that he failed to grasp social situations, student government demands, the rules of group games, and was often babyishly unhappy because of this. A physical coward, always afraid that the ball would hit him or that he would be knocked over. Despite a remarkable memory for facts and names, he could not grasp the import of big human situations in the past. While he could easily have been pushed into High School for Science and Mathematics, he failed in Sixth Grade History. Perfect in formal English he had no literary message for the world which would enable him to cope with the composition of his grade. He was kept busy with extra games, formal gymnastics, manual work, and advanced science, and the academic deficiencies in his grade slurred, it being definitely planned for him to repeat the grade. This year he is among the best in all subjects and is playing heartily and boyishly.

12. Life Age: 10.6. Mental Age: 15.5. I.Q. 146

Below class median in all tests except Geography, Courtis Reading Comprehension, and Principle in Monroe Reasoning.

Above Life Age Average in all Physical Measurements.

Boy from cultured home, slow in all motions. Late for nearly all exercises.

Extremely poor in penmanship. "Lazy." Mind on nothing but play. When forced to work became very nervous at night. A hearty, lovable nature.

Failed in all subjects. Is repeating this year and showing qualities of a real student.

13. Life Age: 11.7. Mental Age: 15.6. I.Q. 134

Below median in all standard tests except Geograghy and Courtis Comprehension.

Below Life Age Average in all Physical Measurements.

A very bright little boy, able to excel in all work but dropped as

a complete failure because he would not apply himself. All play and mischief with no earnestness or sense of moral responsibility.

14. Life Age: 12.3. Mental Age: 17.5. I.Q. 142

Below class median in all standard tests except Reading and Geography.

Below Life Age Average in Height and Grip, and above in Weight.

A very brilliant, erratic boy, excellent in thought, inaccurate in execution. Remarkable literary expression. Poor concentration except where strong personal interest led. Alive on all questions of the day, and keenly sensitive to social responsibilities within the class group.

15. Life Age: 13.2. Mental Age: 18.3. I.Q. 139

Below median in Penmanship and Rate of Monroe Reasoning Test.

Above Life Age Average in all Physical Measurements.

A little girl with apparently great willingness to work yet poor in all lessons through losing papers, failure to follow directions, working wrong assignments. Failed to make her promotion. Excellent social spirit and qualities of leadership. Is repeating her grade with greater earnestness and somewhat greater success.

16. Life Age: 10.7. Mental Age: 16.1. I.Q. 151

Below median in Geography and Penmanship.

Above average in height, weight, and grip.

A boy of charming personality, sturdy in physique, loved by class mates, a good sport, an ambitious, original, and successful student.

17. Life Age: 12.6. Mental Age: 18.5. I.Q. 147

Below class median in Penmanship.

Boy. Loved by everybody. Did not care for play. Rather the typical student. Frail in health.

Below average in height, weight, and grip.

18. Life Age: 9.75. Mental Age: 13. I.Q. 133

Ill when standard tests were given.

Below average in weight and height; above in grip.

This boy is a satisfactory student with pronounced qualities of leadership. Remarkable for his cooperation with both teachers and pupils. Frail in health.



(Several of the exceptionally high I.Q.'s referred to on page 3 are not included in this account because they are new this year.)

The foregoing exposition of our experience with superior children certainly indicates that the answer to the inquiry what is to be done with them does not consist in speeding them along the educational track.

There is no doubt that up to a certain point intelligence is the determining factor in a child's school career. That is to say if he does not have intelligence he cannot use it. Patience, care, good formal work, etc., will often carry him much farther in acquiring the elementary tools than is commonly supposed but a child with an I.Q. under 110 is not usually going far into the realms of abstract thinking.

On the other hand the possession of intelligence does not insure its steady and successful application. It may be the most important signal factor in academic success but it is not enough. If we premise that all children with I.Q.'s above 110 are potential academic successes we must not expect a full realization of this success, especially not in the elementary grades. A difference of I.Q. between 70 and 80 or even between 90 and 100 manifests itself unmistakably in a child's comprehension of school work. On the other hand a difference of 10 points above 120 is negligible whereas attitude and will power often tip the scale. In other words, attainment does not steadily advance as I.Q.'s grow higher.

I. Many high I.Q.'s are poor in muscular control. Undoubtedly this is exaggerated in the teacher's mind from the fact that muscular development correlates with physical rather than with mental age. Therefore a child of eight who writes or plays or performs formal gymnastics normally for a child of eight is handicapped if asked to compete with children of ten or twelve who may be his equals in mental age. Our experience also leads us to believe that a considerable number of very bright children are deficient in muscular control even for their life age. This is a great handicap in meeting our modern school requirements. Such children may think out problems which can never be worked, plan compositions, or know the answer to history or geography exercises which can never be written because of slow execution. The prescription here indicated seems to be an unusual amount of hand training.

II. A very considerable number are counted as "lazy" at least through their early childhood. They like to read and to listen to grown up conversation which they often join with intelligent questions or com-

ments, but they will not apply themselves to "dig." Their minds are on play or on personal projects. Frequently this is a normal and most desirable protection. They are preserving their excellent minds from the conventionalizing influences of the school. In early adolescence there is sometimes a sudden awakening and a student evolves from the indifferent child. Now and then a highly educated parent says of such a child, "Let him alone. I was just the same until I was fourteen. Then I suddenly wakened up and got ready for college in two years."

On the other hand we all know brilliant failures in the adult world, men and women with unusual intelligence who never settle down to anything. Can we learn to reduce their number by a wiser handling of this difficult type of child?

III. Then there are those very inaccurate children who always know how the thing should be done but never do it, who can explain the most involved problem, but in working say, seven plus eight are thirteen. They are quite unimpressed by the seriousness of this trait since to them the only essential is to know how. They conceive great plans in manual work, wonderful designs in art, excellent plots for stories but the hand falters, the purpose wavers, the execution fails. Some overcome this tendency sufficiently to do excellent work in high school or college where the formal processes are of less relative importance. Others are always inaccurate themselves but make good directors with secretaries and clerks to do the work. In some cases this quality means that they can inspire others by a vision of perfection which they can never attain. As one of the patient plodders is represented as saying of the genius,

"There burns a truer light of God in them,  
In their vexed, beating, stuffed, and stopped-up brain,  
Heart, or whate'er else, then goes on to prompt,  
This low-pulsed forthright craftsman's hand of mine.  
Their works drop groundward, but themselves, I know,  
Reach many a time a heaven that's shut to me,  
Enter and take their place there sure enough,  
Though they come back and cannot tell the world."

In the elementary grades where the acquiring of tools is the main object, this type of child falls in attainment far below the level of his mental ability.

IV. Then there are those children whose maturity of judgment especially in matters of human relationship, not only fails to keep pace



with their intellectual growth but, as we feel, with their life age as well. If they are advanced much beyond children of their age they are unhappy themselves and become annoying to others through their foolish babyish attitude. Social life with their peers is their crying need and intellectual nourishment must be given in broader fields of collateral research rather than by crowding them up to greater social disparity.

V. Our experience has shown us that a large number of very bright children are neurotic and that their great need is not intellectual stimulation but the calmest, most vegetative life that modern civilization can afford. Like throbbing engines their minds beat on far into the night, and unless helped to slow down will beat themselves out long before maturity.

VI. All the above types are problems, many of them moral problems but the last type I shall name is the gravest moral of all. The keenly intellectual person is almost invariably egocentric. He works for the joy of the intellectual activity and he works for himself and his own advancement. Fond parents, doting relatives, admiring classmates, proud teachers all contribute their share of exploitation and foster the child's belief in his own remarkable powers and his scorn for the stupidity of "the others." Rapidly advanced among pupils older than himself, he becomes their pet and toy or occasionally the object of their jealousy. Segregated with others of his own age and type, he is isolated from the common herd of ordinary minds. The engrossing thought of all about him is how to plan his brilliant career and help him to strut across his little stage. The idea of service, of responsibility, because of his special gifts is almost impossible to inculcate both because of his inherent make up and because of the odds against him in the attitude of others.

The problem of meeting the needs of the brilliant child appeals to me preeminently as a moral problem, a problem in the preparation for service of the highest order. Rapid advancement is not the patent recipe. We need long and painstaking study of the different parts of the curriculum and the exact qualities, mental and physical demanded by each. We must learn to supply sufficient mental nourishment to the precociously active mind, without at the same time demanding concepts, self control, and execution which only the experience of years can give. Only so can we assist these children to develop their talents in accord with their high promise.

Astounding prodigies which can only be described with superlatives



are of little value to humanity unless they can be endowed with practical efficiency and acquire magnetic power to attract their less gifted brethen and so become leaders of the human race "on toward the heights."

(Grateful acknowledgement is made to Dr. Edgar A. Doll of the Department of Institutions and Agencies at Trenton, New Jersey, for his unfailing kindness in advising with reference to the arranging of this data and the statistical handling of the same; and also to the three teachers associated with me in my department but for whose earnest labors and sympathetic insight into varying types of personality, the close study and understanding of these children would not have been possible.)

# "HOW TO STUDY" AS A SOURCE OF MOTIVE IN EDUCATIONAL PSYCHOLOGY

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AND

CARL COLVIN

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*How to study* was the chief centre of interest and source of motive in a course in educational psychology in the University of Illinois the first semester of 1919-1920. This work was given as an undergraduate course, the prerequisites for which were junior-senior standing and Education 1 or Psychology 1.

The chief subject matter topics covered were: instincts, capacities, self-activity, self-direction, habit (including the acquisition of skills), judgment, perception, memory, improvement and individual differences. These were utilized in the solution of problems and in the furthering of project.

The course was opened with a brief consideration of the field of educational psychology and the students were encouraged to list such of their questions as seemed to them to have bearing on this field. Of these questions, those which most directly pointed to introspection were given preference. Their consideration naturally led to the general problem of what we do when we study. After a preliminary consideration of these problems, the students were asked to list exactly what they did when they studied. A classification of these lists showed the following numbers mentioning the employment of the various factors. There were forty-five students in the class.

Physical conditions by 20

Having purposes by 14

Reading ability by 6

Supplementing statements by 13

Organizing to show full values and relationships by 23

Memorizing by 13

Using as a final step by 2

Preserving individuality by 1

## MAINTAINING AN OPEN MIND

It is probable that certain, and perhaps several of these forty-five students were employing, at least to a degree, more of the factors

than the above list would indicate. However, their statements were interpreted liberally and the above table shows all that their responses, as made to a specific assignment, would justify.

After having listed their procedure in study, each student was furnished with the arrangement of the factors of study as shown in form I and each graded himself by filling out this form.

These forms as filled were collected to prevent the students from being unduly influenced by their first gradings when they were asked to regrade themselves later in the term. This precaution was also taken regrading the second gradings.

As aid to further detail of study and a fuller appreciation of the respective factors, the first seven factors were outlined as indicated under II form.

#### HOW TO STUDY

Name of Student .....

#### Education 6

#### Form I. Records of Capability in the Main Factors.

(Note: After a brief survey of the problem, each student will write in his own way what he does when he studies. Then, after a brief explanation of the following classification of factors, each student will hold his statement of his own study procedure before him and score himself by placing crosses (x) in appropriate squares. After the factors have been studied intensively and applied, other records of capability will be made).

The main factors in study	Ratings of capability				
	Poor	Fair	Good	Very good	Excellent
1. Favorable Physical Conditions....					
2. Having Purposes.....					
3. Reading Ability.....					
4. Supplementing Statements.....					
5. Judging the Worth of Statements..					
6. Organizing to Show Values and Relationships.....					
7. Memorizing.....					
8. Using as the Final Step.....					
9. Preserving Individuality.....					
10. Maintaining an Open Mind.....					
11. Other Helpful Habits.....					

Record with crosses (x) made ..... 1920.

Record with checks (✓) made ..... 1920.

Record with circles (0) made ..... 1920.



## Form II. A Detailed Survey of the Main Factors in Study.

(Note: References will be cited by abbreviations: *D* Dewey's *How We Think*; *H*—Hall-Quest's *Supervised Study*; *K*—Kitson's *How to Use Your Mind*; *M*—McMurry's *How to Study and Teaching How to Study*; *S*—Sandwick's *How to Study and What to Study*; *St*—Starch's *Educational Psychology*; *Wh*—Whipple's *How to Study Effectively*; *Wi*—Wilson's *Motivation of School Work*. The references to Whipple are by rule—with others, Roman numerals refer to chapter, Arabic to pages).

1. Physical conditions	Ratings of capability					
	Poor	Fair	Good	Very good	Excel- lent	Chief references
(1) Physiological, Health, etc..						
<i>a.</i> Hygiene of Nervous System.....						H 64-74 Wh 1, 10 S 22
<i>b.</i> Freedom from Physical Defects.....						Wh 2
(2) Environmental.....						Wh 3 H 75-83
<i>a.</i> Light, Temperature, etc.						Wh 4
<i>b.</i> Place.....						Wh 4 S 23-27
<i>c.</i> Time.....						H 161-166
<i>d.</i> Absence of Distractions.						St 181 H 91
2. Purposes.....						
(1) Compelling.....						Wi I-IV Wh 12
(2) Specific.....						M 36-46
(3) Intrinsic.....						M 31-36 W 15

Record with crosses (x) made..... 1920.

Record with checks (✓) made..... 1920.

Record with circles (0) made..... 1920.

Name.....

One of the assignments in connection with the study of the physical factors was to list items of improvement. These were listed in two different assignments two weeks apart.

As indicated in table I, forty-five students reported 190 improvements and 24 additional needs for improvement.

Under the factor, "Purposes," much was made of instincts and interests as furnishing the original purposes of man, and of self-activity as the condition under which desirable purposes operate. Reading abilities furnished the largest field for utilizing help from educa-

TABLE I  
Items of improvement in the physical factor

	1st wk. in Oct.		3rd wk. in Oct.	
	Accepted	Needed	Accepted	Needed
<b>Environmental conditions:</b>				
Better ventilation.....	3	1	5	
Regulation of temperature.....	5	2	5	1
Correction in lighting.....	23	4	12	
Readjustment of furniture.....	15	3	8	2
More quiet surroundings.....	10	4	8	1
Forming place-study habit.....	6	4	8	1
Forming time-study habit.....	16	7	12	3
<b>Bodily conditions:</b>				
Systematic exercise.....	...	6	5	7
Regular sleep.....	9	7	3	4
Rest between applications.....	...	3	2	1
More comfortable clothing.....	1	2	3	
Better habits of eating.....	2	..	3	1
Erect posture in study.....	3	..	1	
More orderly equipment.....	4	3	4	2
Correction of defective eyesight.....	1	1	4	
Work done on teeth.....	...	2	3	
Improvement in general health.....	6	2	2	2
Totals.....	104	47	86	24
	...	..	104	—
GRAND TOTALS.....	...	..	190	24

tional psychology. This is considered somewhat in detail below. The most direct psychology help in supplementing statements was found in the nature of the apperceiving process and in the nature of the mental processes required for elaboration. The psychology of judgment, self-direction, etc., aided in the judging and organization factors. Under memorizing were considered memory as an inherited capacity, and means of improving in memorizing.

As the nature of the eighth, ninth, and tenth factors of study as listed places them most definitely in the field of the principles or philosophy of education, they were not specifically taken up in this course.

The work of the course afforded most help in the factor, silent reading. This help was sought through the employment of two means, (1) controlled practice, (2) study of the Psychology of the Silent Reading Process. The chief topics of study were:

- Reading as a tool in study
- Relation of rate to comprehension
- The importance of adequate motivation
- Instincts and capacities involved in reading
- Relation of reading to language instinct
- The element of habit in reading
- Perception of meaning
- Eye movements
- The effect of articulation
- The neurone-synapse-bond hypothesis
- The work curve.

The practice means of improvement consisted of approximately thirty hours (fifty minutes each) in reading educational psychology and five hours in reading such material as appears in the first pages of the Outlook. About twenty hours of this practice—the practice in educational psychology—was spent in reading comparatively easy books such as Kirkpatrick's *Individuals in the Making*; Strayer and Norsworthy's *How to Study*; Seashores' *Psychology of Daily Life*; and the other ten hours of practice in educational psychology were in Thorndike's *Briefer Course*.

As measured by a test in reading educational psychology, the class as a whole increased their capabilities by more than one-half ( $\frac{1}{2}$ ). And as measured by the Monroe Silent Reading Test with Stone's Extensions their average rate score after practice and study was 74 per cent gain over that of average scores before practice and study; and their average score in comprehension after practice and study was 84 per cent above that before practice and study. They gained nearly three (3) times as much in speed and fully three and a half ( $3\frac{1}{2}$ ) times as much in comprehension as the check class. In terms of the median, the median student who did the practice and study had 180 per cent of the rate ability possessed by the median student of 405 typical equivalent students without training and study. And in comprehension, the median student of those who worked on this factor also had 180 per cent of the capability of the median of those without practice and study.

There were individual gains of over 190 per cent in comprehension and 160 per cent in speed. Contrary to the usual experience, students



with lowest initial scores made the greatest gains. The authors are unable to account for this fact.

The benefits of work on this factor as stated by individual students are summarized below:

A number of different factors are involved in any gains which were made in this continued exercise. Student's reports showed that different individuals gained because of different features of the plan. The old saying "Nothing succeeds like success" changed to read "Nothing aids reading like reading" may be applied to the results of this exercise. The fact that each student was required to read a definite piece of material for a definite length of time was a factor in the accomplishment of the task. More reading in the field of Educational Psychology was done by the class under the stimuli of the exercise than would ordinarily have been done according to the statements of the students. This practice was a good general aid in increasing the reading ability. Students were able to increase their power of concentration by following a definite program and bending every effort to concentration while they were reading. The factor of concentration seemed to be the most important item concerned in securing increased rate and comprehension. This fact was also very evident in a prolonged exercise of this type conducted with a class of high school boys. The boys seemed to be unable to concentrate and were reading their lessons several times in an attempt to get the content, but were not getting good results. After a few weeks of directed practice these high school students were able to get the thought from the text in much less time and the rate of reading increased remarkably. The students in this particular high school class held the opinion at first that those who read most slowly received more from the text than those who read very rapidly, but after the directed practice most of the students held a different opinion. They were able to concentrate better when the watch was held on them than when reading without such stimuli.

The directed practice in the case of the university class suggested certain mechanical aids to students who were eager to increase their rate. Such physical factors as position at the table or in the chair while reading were brought to the attention of the students. One student found that he could train the eye by using an ordinary postal card to cover the page, dropping it one line at a time as he read down the page, thus gaining speed in reading because the eye did not advance beyond the line to be read. While this device was not a

practicable one to be used continuously while reading it did seem to aid in developing speed in reading. The use of such a mechanical device seemed to train the eye in its movement though there is not proof enough to substantiate this claim. Many students said that they were aided most by the fact that they had set before them a definite piece of work to be done and that they worked against time to get it done. The practice obtained in this way seemed to give the same kind of results that the driver obtains when he trains the trotter to the mile track by constant practice.

#### CONCLUSIONS

The results of the course are believed to justify the following conclusions:

1. That a high degree of desirable motivation may be secured for educational psychology through "How to Study."
2. That "How to Study" may profitably serve as a main centre of interest and source of motive for a semester's course of three periods per week.
3. That the degree of improvement as illustrated by the factor, silent reading, is fairly startling.
4. That the plan of having students judge of their own capabilities notably increases their interest.

# TWO IMPORTANT POINTS WITH REGARD TO AGE- GRADE TABLES

S. L. PRESSEY

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The writer was much interested in the paper regarding age-grade data by Superintendent Witham in the November 1919 issue of the Journal, and in the further discussion by Superintendent Williams in the January 1920 number. There are two points with regard to age-grade distributions which seem to the writer very important, and which he wishes to mention briefly in this connection. Both these points may be exemplified by reference to the two age-grade distributions presented below.

TABLE I  
Age-grade distributions  
City C

Age	1	2	3	4	5	6	7	8	9	10	11	12	Total	Age
5	2	...	...	...	...	...	...	...	...	...	...	...	2	5
6	60	2	...	...	...	...	...	...	...	...	...	...	62	6
7	60	40	2	...	...	...	...	...	...	...	...	...	102	7
8	34	57	37	2	...	...	...	...	...	...	...	...	130	8
9	9	30	60	35	1	...	...	...	...	...	...	...	135	9
10	1	22	19	58	29	...	...	...	...	...	...	...	129	10
11	...	6	14	41	50	21	1	...	...	...	...	...	133	11
12	...	3	8	29	39	38	25	1	2	...	...	...	145	12
13	...	...	3	9	22	28	29	24	8	...	...	...	123	13
14	...	...	1	4	2	18	28	25	38	3	...	...	119	14
15	...	...	...	...	5	5	4	13	27	15	2	...	71	15
16	...	...	...	...	...	...	1	5	25	25	14	3	73	16
17	...	...	...	...	...	...	...	...	1	12	16	27	56	17
18	...	...	...	...	...	...	1	...	1	1	9	16	28	18
19	...	...	...	...	...	...	...	...	...	...	...	8	8	19
20-21	...	...	...	...	...	...	...	...	...	...	1	3	4	20-21
Total	166	160	144	178	148	110	89	68	102	56	42	57	1320	
													1320	



City F

Age	1	2	3	4	5	6	7	8	9	10	11	12	Total	Age
5	...	...	...	...	...	...	...	...	...	...	...	...	0	5
6	105	3	...	...	...	...	...	...	...	...	...	...	108	6
7	52	65	...	...	...	...	...	...	...	...	...	...	117	7
8	12	69	74	3	...	...	...	...	...	...	...	...	158	8
9	...	11	58	71	2	...	...	...	...	...	...	...	142	9
10	...	4	22	62	58	3	...	...	...	...	...	...	149	10
11	...	...	...	26	67	61	...	...	...	...	...	...	154	11
12	...	...	...	10	29	66	53	...	...	...	...	...	158	12
13	...	...	1	5	13	40	47	50	...	...	...	...	156	13
14	...	...	1	1	7	16	41	53	36	2	...	...	157	14
15	...	...	...	1	1	2	14	22	35	28	2	...	105	15
16	...	...	...	...	...	...	...	12	8	22	24	1	67	16
17	...	...	...	...	...	...	...	1	1	4	24	15	45	17
18	...	...	...	...	...	...	...	...	1	2	4	9	16	18
19	...	...	...	...	...	...	...	...	...	...	3	8	11	19
													1543	
Total	169	152	156	179	177	188	155	138	81	58	57	33	1543	

*I. For many practical situations, the best single statement of the age-grade situation is in terms, not of per cent of retardation, but of median age per grade.*

Superintendent Witham very properly complains of the lack of agreement among different school systems as to when and how an age-grade census shall be taken, as to what shall constitute retardation, and so on. As a matter of fact, he might well have complained also of the excessive labor involved in the study of the age-grade situation according to some of the methods at present in use. The census must be taken on such and such a day, the age being considered at such and such another day; the slow, normal and rapid-progress groups may be tabulated separately—and so on. And unless other age-grade studies use the same method, to the dot, comparisons are risky if not impossible. But is not the real fault with the unusual statistical method—percentage of retardation—in terms of which such data are usually expressed?

The writer has found that, for most purposes<sup>1</sup> a census taken at

<sup>1</sup> Not for all purposes, of course; important special influences may operate to make the age-grade situation somewhat different at different times in the year. But ordinarily the age-grade table is made primarily for the purpose of studying

practically any time of the year and handled in terms of percentiles, (particularly median age per grade) with allowance made in comparisons for differences in the time of year in which the study was put through, gave all the information desired. Thus, if one school system is studied in March and the other in May, comparisons can be made directly by simply adding two months to the median ages found for the system examined in March. The analysis of the age-grade tables given in Table I will serve as an example of the ease with which the important facts can be deduced with such a handling. As a matter of fact, the two cities were studied at the same time of the year, so any calculations to offset a difference in time of studying were not necessary; but, had they been necessary, the amount of .081 year would have been added to, or subtracted from, the median age of each grade for each month of difference between the two dates. The census was made in March. The median ages of each grade at that time were as follows:

Grade	1	2	3	4	5	6	7	8	9	10	11	12
City C.....	7.35	8.68	9.55	10.90	11.88	12.90	13.64	14.36	15.11	16.40	17.31	17.94
City F.....	6.80	8.12	9.06	10.25	11.42	12.45	13.52	14.36	15.13	15.97	17.10	18.06
Difference.....	.55	.56	.49	.65	.46	.45	.12	.00	-.02	.43	.21	-.12

Differences expressed in hundredths of a year perhaps do not look very surprising; but when it is realized that the children in the first grade of City C are nearly *six* months older than the same children in City F and that the children in grade 4 are over *eight* months older than those in City F, then things begin to look serious.

Such treatment of age-grade data (in terms of median age) thus makes possible fairly satisfactory comparisons even if the data were not obtained at the same time of year. But there are other advantages. Summary of the tables in terms of central tendency is much more suited to the major problem under consideration. It is surely this difference in the age of the average child that is the important difference, in comparing schools with differing rates of retardation. The important point is not that some of the children are backward, or retarded

the larger general facts and trends of the movement through the grades. And for such purposes it makes (so far as the writer has been able to observe) relatively little difference what time of the year the census is taken, providing only that it is not made too near either end.

according to some set standard, but that, *on the average*, the children take longer to reach a certain grade in one system than in the other. And to compare averages in terms of per cent of cases at the extremes is surely an odd bit of statistical procedure, not calculated, either, to give a finding of the greatest reliability.<sup>1</sup>

Perhaps one does wish, however, to examine the extremes of the distribution, and to get some notion as to the comparative extent to which bright children are moved along rapidly and dull ones are held back. This may be done by finding the percentage of "retardation" and "acceleration." But why not, instead, calculate the ten and ninety percentiles? A comparison of the two cities studied in this way is made in the tables presented below.

Grade	10 Percentiles											
	1	2	3	4	5	6	7	8	9	10	11	12
City C.....	6.24	7.35	8.34	9.45	10.48	11.53	12.32	13.25	14.00	15.17	16.16	17.10
City F.....	6.16	7.19	8.21	9.21	10.27	11.26	12.29	13.28	14.22	15.14	16.15	17.15
Differences.....	.08	.16	.13	.24	.21	.27	.03	-.03	-.22	.03	.01	-.05

Grade	90 Percentiles											
	1	2	3	4	5	6	7	8	9	10	11	12
City C.....	8.80	10.68	11.83	12.83	13.64	14.66	14.90	15.86	16.66	17.61	18.65	19.66
City X.....	7.91	9.00	10.38	11.96	13.25	13.98	14.96	15.96	16.23	17.05	18.33	19.59
Differences.....	.89	1.68	1.45	.87	.39	.68	-.06	-.10	.43	.56	.32	.07

These tables give us much further information with regard to the two school systems. They suggest that the reason that the children are, on the average, so much older in City C is, not because the whole distribution is higher, but because the children who have once dropped behind are so severely dealt with. This is, of course, another way of saying that City C has a very high percentage of "retardation," as compared with City F, but about the same "acceleration," however, the method described above is statistically much

<sup>1</sup> The method is surely much more sound than an attempt to get at promotion rates indirectly, from the age-grade table, by means of "percentages of retardation" calculated from such tables. But more than this the writer is inclined to believe that these median ages are rather more informing, in giving the large facts of the situation, than a direct study of promotion rates would be.



more exact and sound.<sup>1</sup> Or to put still another face upon it, the range of ages in a given grade in City C is much greater, particularly for the second and third grades, where the distance between the 10 and 90 percentiles is almost twice as great in City C as in City F.

It would surely be interesting if we had thoroughly worked out standards for median age per grade and also standards for other points on the distribution, either the 10 and 90 percentiles or the quartiles,—from which, of course, could be deduced standard ranges. In fact, some measure of the dispersion of the ages of the children in a given grade would seem highly desirable. Statements in terms of percentage of retardation give us neither dispersion nor central tendency; the method is, in fact, extremely odd statistically—as well as inconvenient. The writer would strongly urge, instead, the treatment of age-grade data according to some such standard statistical procedure, as both more convenient and more sound. In fact, such treatment often brings out facts which would hardly be found otherwise.

*II. Differences in Age-Grade distribution, from school to school and from system to system, must always be taken account of in using tests; this can best be done in terms of median age per grade.*

Again the distributions of Table I will serve as an example. Grade norms obtained in one city are essentially impossible of application in the other, unless some allowance is made for differences in the age-grade situation. The fourth grade children in City C average about 8 months older grade than the fourth grade in City F. The fourth grade in City C is obviously *not* a comparable group, then, with the fourth grade in City F, so far as maturity is concerned. But a close study of the distributions will show other differences. In City C the children tend to be held in the first three grades; in the second city the incidence of retardation is in the fourth and fifth grades. The selection for the upper grades is also different in the first city. There are practically the same number of children in the first grades of the two cities, (166 and 169 cases, respectively); only 41 per cent of this number are in the eighth grade in the first city, compared with 62 per cent in the second city. It is clear that grade

<sup>1</sup> That is, more sound as a method of summarizing the age-grade table. An actual study of retardation and acceleration (that is, number who have been retarded and accelerated) is a different matter; for certain purposes such an actual enumeration of the retard and accelerates is undoubtedly desirable. But such an actual retardation study is a different matter from an age-grade table summarized in terms of "retardation."

norms established in one place *cannot* be applied indiscriminately elsewhere.

This is, as a matter of fact, coming to be quite generally recognized and, instead of grade norms, we find age norms being used. The writer believes this move rather unfortunate, because age norms are even more difficult matters than grade norms. And again, a study of Table I will show why. Suppose, for instance, a test in the fundamentals of arithmetic or a test in silent reading should be given from the third through the eighth grade. This is a somewhat unusually long range for a test of achievement, but such a test will illustrate the difficulties of age standardization under even the most favorable circumstances. The question then is: "Can satisfactory age norms be obtained, if all the children in the system, from the third through the eighth grade, are examined with this test?" It should be noticed, in the first place, that in City C there is *not one single age* at which all the children, of that age, will be included in the norms. In this city, 63 per cent of the eight-year-olds, 35 per cent of the nine-year-olds, 18 per cent of the ten-year-olds, 5 per cent of the eleven-year-olds, 3 per cent of the twelve-year-olds, 6 per cent of the thirteen-year-olds, 35 per cent of the fourteen-year olds, would not take the examination at all. And, unless a census on that day were taken of the entire school system from the first grade through high school, it would not be possible to allow for these losses, because the examiner would have no way of knowing how many he had missed. In City F, the situation is distinctly different. All eleven, twelve, and thirteen year old children would, if the examination were given at this particular time, be tested; 51 per cent of the eight-year-olds, 8 per cent of the nine-year-olds, 3 per cent of the ten-year-olds, and 24 per cent of the fourteen-year-olds would not take the test, in this city. Surely no one can believe that, under such circumstances general age norms can be established, or reasonable comparisons made from school to school or system to system. If the test covers, as most achievement tests do, only two or three grades, the situation is even more hopeless. A test given to the Junior High School of City C would not test more than 45 per cent of the children at *any* age. A similar test in City F would get scores from 62 per cent of the thirteens, the highest per cent at any age.

There is a further factor of great interest to be considered here. In City F practically all the fourteen-year-old children are in school; there are 158 twelve-year-olds and 157 fourteen-year-olds. But in City

C there are 145 twelve-year-olds to 114 fourteen-year-olds. The elimination has begun to show, in fact, at thirteen, there about 20 less thirteen-year-olds in City C than one would expect. And, to glance a moment at the other end of the age situation, the first city shows only half the expected number of six-year-olds, whereas in City F there are about 75 per cent the expected number. The situation seems hopelessly complicated and special, and the obtaining of any general age norms practically impossible.<sup>1</sup>

What is the solution of the difficulty? The best way out of it, to the writer's mind, is not to attempt age norms at all, in work with tests of achievement, but to give instead, with the grade norms, the median age of the grade. This will permit of allowance for differences in the age-grade make-up of different schools. It will also largely allow for differences in selection, since high selection for the upper grades, and excessive elimination, usually go with a high retardation. There will, incidentally, be no more opportunity for the school with the high retardation to come out triumphant on tests. Further, allowance can more easily be made for testing done at different times of the year. In short, a simple statement of median age per grade will (the writer believes) add much more to the usefulness of norms, for tests of either intelligence or achievement, than may at first be realized.

<sup>1</sup> It may also be added that the different schools within a single school system are likely to differ even more than two separate systems. For a further discussion see: Pressey, S. L.: A comparison of Two Cities and Their School Systems by means of a Group Scale of Intelligence. *Ed. Ad. and Super.*, Feb., 1919; or The Problem of the Unselected Group in the Standardization of Tests. *Jour. Appl. Psych.*, Dec., 1920.





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## THE CORRELATION BETWEEN COLLEGE GRADES AND THE ALPHA INTELLIGENCE TESTS\*

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In October, 1919 the Army Intelligence Test Alpha was administered to five thousand nine hundred and fifty students at the Ohio State University. This study of the correlation between college grades and the scores on the Alpha examination and the various tests thereof, was made on the basis of the data thus obtained.

For purposes of correlation, samples were selected from the various classes and colleges in proportion to the total number of students in these groups. There were seven hundred and sixty seniors examined. From these a random sample of two hundred was selected by drawing approximately every fourth card from the files for seniors. Thus the College of Agriculture with a total of one hundred and thirty-eight seniors examined furnished thirty-six cases, the College of Arts with a total of one hundred and twenty-four seniors examined furnished thirty-one cases, and so on for others. In the same way one hundred juniors and one hundred sophomores were selected at random from their classes. In the case of the graduate students only those were selected whose under-graduate records were available. This group consisted of only thirty-six cases.

The academic standing of each of these students was determined in the following way. Records of the number of hours of each grade, M, G, A, P, and F were obtained from the registrar's office. These grades were reduced to a quantitative basis by means of the university point credit system. Each credit hour of M (merit) was weighted by multiplying it by 2; each credit hour of G (good) by 1.2; each credit hour of A (average) by 1; each credit hour of P (poor) by .8;

\*Paper read before the American Psychological Association, Chicago, Dec., 1920.

and each F grade (failure) was multiplied by 0. The sum of the points credit thus obtained was divided by the total hours credit. A single numerical value representing the student's academic status resulted. This value may be called the *point-hour ratio*. A point-hour ratio of 1.00 will indicate a student of average academic standing, and deviations above or below this ratio will indicate corresponding deviations above or below the average in college grades. The following student record will illustrate the derivation of the point-hour ratio:

Semester	Grades					Total
	F	P	A	G	M	
I.....	..	13	4	....	....	17
II.....	..	3	1	6	....	10
III.....	..	6	8	....	5	19
IV.....	..	....	6	....	5	11
V.....	..	8	10	3	....	21
VI.....	..	11	1	7	....	19
VII.....	..	....	7	6	4	17
VIII.....	..	....	3	5	7	15
Hours.....	..	41	40	27	21	129
Weighting.....	0	.8	1.0	1.2	2.0	
Points credit.....	0	32.8	40	31.4	42	145.2

Point-Hour Ratio  $145.2 \div 129 = 1.19$ .

The scores of the entire student body on the intelligence test (Army Alpha) range from 27 to 211 points. These scores were converted into percentile ranks. The percentile rank of a student is the percentage of the whole student body that he exceeds in his performance on the test. The percentile ranks of our sample of four hundred and thirty-six students were used instead of the raw scores in the study here reported. Our first problem is thus to determine the relationship between percentile ranks and point-hour ratios.

This relationship in the case of our four hundred and thirty-six students is shown in the correlation array, Table I. The most striking thing about this table is the large number of cases in the upper left hand quadrant. This means that many students of high intelligence get low academic scores. It will be noted that some fewer students of low intelligence (as measured by Army Alpha) attain comparatively high academic scores. Nevertheless, the general trend



of the cases shows a positive relationship. The Pearson Product-Moment Correlation is .35, as determined by the formula

$$\frac{\sigma_x^2 + \sigma_y^2 - \sigma_{(x-y)}^2}{2\sqrt{\sigma_x^2 \cdot \sigma_y^2}}$$

TABLE I  
Correlation between intelligence and scholarship

Percentile rank (Alpha)	Point-Hour ratio																		Number cases
	30 39	40 49	50 59	60 69	70 79	80 89	90 99	100 109	110 119	120 129	130 139	140 149	150 159	160 169	170 179	180 189			
95-100	...	...	...	...	...	4	2	7	4	7	6	1	1	1	1	1	35		
90-94	...	...	...	...	1	3	7	3	3	3	3	3	1	2	...	...	29		
85-89	...	...	...	...	2	3	6	9	1	2	2	3	1	1	...	...	30		
80-84	...	...	...	...	2	...	8	7	6	4	4	1	2	...	...	...	34		
75-79	...	...	...	...	2	1	4	8	3	5	...	1	...	2	...	...	26		
70-74	...	...	...	1	...	4	5	4	3	2	3	3	...	...	...	1	26		
65-69	...	...	...	...	1	4	1	3	3	1	...	...	...	...	...	...	13		
60-64	...	...	...	2	...	3	6	6	3	2	3	1	1	...	...	...	27		
55-59	...	...	...	1	2	4	5	7	5	2	3	...	...	...	...	...	29		
50-54	...	...	...	...	1	1	2	12	...	...	1	...	...	...	...	...	17		
45-49	...	...	1	...	...	2	4	6	1	2	...	...	1	...	...	...	17		
40-44	...	...	...	...	2	2	6	7	3	...	...	...	...	...	...	...	20		
35-39	1	...	...	...	2	3	8	5	1	...	2	1	...	...	...	...	23		
30-34	...	...	...	...	...	5	4	1	1	1	...	...	1	...	...	...	13		
25-29	...	...	...	1	...	5	5	2	2	2	...	...	...	...	...	...	17		
20-24	2	1	...	...	...	2	6	7	...	1	...	...	...	...	...	...	19		
15-19	...	...	...	...	...	2	9	1	...	...	...	...	...	...	...	...	12		
10-14	...	...	...	...	3	6	5	5	...	2	1	...	...	...	...	...	22		
5-9	...	...	...	...	...	4	8	4	3	...	...	...	...	...	...	...	19		
0-4	...	...	...	...	...	5	1	2	...	...	...	...	...	...	...	...	8		
Number cases.....	3	1	1	5	18	63	102	106	42	36	28	14	8	6	1	2	436		

On the basis of the intelligence test, the students in the University were grouped into five classes as follows:

CLASS	POINTS	APPROXIMATE PERCENTAGE IN EACH CLASS
I	178-212	5
II	155-177	20
III	115-154	50
IV	85-114	20
V	0-84	5

The relationship between the intelligence class attained and the point-hour ratio is shown in Table II. The percentage distribution of academic grades for students of each class is given. F and P mean

that the point-hour ratio for these cases is less than 1.00, A means that it is 1.00 to 1.19, and G and M mean that it is 1.20 or higher. The number of cases in each class is also given. Classes I and V contain the total number of students in these classes for whom grades could be obtained. Classes II, III and IV contain only students from the above mentioned sample of four hundred and thirty-six cases.

TABLE II

Percentage distributions of academic grades for students of each class

Class	F and P	A	G and M	Number of cases
I	25.1	32.2	42.7	274
II	32.8	33.6	33.6	119
III	46.6	37.1	18.3	202
IV	66.7	27.8	5.5	72
V	88.3	8.4	3.3	274

The relationship between scholarship and intelligence may also be shown by presenting a percentage distribution of intelligence ratings for each academic grade. This is given in Table III. The grades F and P, and the grades G and M are combined as before. The distributions for the academic grades are based upon the sample of four hundred and thirty-six cases. The distribution for the whole university is given in the first row of the table, and there are also added for comparison intelligence distributions of students elected to Phi Beta Kappa in 1920, and of students placed on probation at the end of the first semester because of poor academic work.

TABLE III

Percentage distributions of intelligence ratings for students of different academic grades.

Intelligence rating	V	IV	III	II	I	Number cases
Whole University.....	5.0	20.0	50.0	20.0	5.0	5950
Phi Beta Kappa.....	.0	.0	39.3	35.7	25.0	28
G & M.....	.0	4.2	34.7	42.1	19.0	95
A.....	1.3	13.5	50.7	27.0	7.5	148
F & P.....	3.1	24.9	48.7	20.2	3.1	193
Probation.....	11.6	28.4	44.7	13.6	1.7	588

A study of the relationship between intelligence and academic status in the case of students of different ranks was next taken up. Our sample of four hundred and thirty-six students was divided into five groups: a group of thirty-six graduates, two groups of seniors of one hundred students each, a group of one hundred juniors, and a group of one hundred sophomores. Product-moment correlations were calculated separately for each of these groups with the following results: Thirty-six graduates, .15; first sample of one hundred seniors, .38; second sample of one hundred seniors, .35; one hundred juniors, .29; one hundred sophomores, .29. The higher correlation in the case of the seniors may be due to the fact that the point-hour ratios of these students were calculated from six semesters' work; but, on the other hand, the correlation for the thirty-six graduates whose point-hour ratios were calculated from eight semesters' work, is lowest of all. This may probably be accounted for by the very limited number of cases.

These results compare very favorably with the correlations between grades and scores on intelligence tests that have been obtained in many previous studies of pupils in primary and secondary schools. The figures obtained are decidedly significant, especially when it is remembered that college grades depend upon many factors in addition to intelligence, for example, interest, perseverance, and so on. Our correlations are however lower than those obtained by other investigators with college students. H. T. Hunter<sup>1</sup> reports a correlation of .52 between the Alpha intelligence test scores and college grades in the case of one hundred and fifty-nine women students in Southern Methodist University. S. S. Colvin<sup>2</sup> of Brown University also reports correlations between the Army test and college marks as follows: Army test and marks of first semester, .44; army test and marks of second semester, .39; and army test and average marks of two semesters, .45. These differences may be due to differences in the group studied (such as degree of homogeneity), or to the method of marking, method of weighting college grades to obtain numerical scores, and so on.

Our next problem was to determine the correlation between point-hour ratios and each of the tests in the army alpha examination taken

<sup>1</sup> Hunter, H. T.: Intelligence Tests at Southern Methodist University. *School and Society*, 10, 437-440, Oct., 1919.

<sup>2</sup> Colvin, S. S.: Psychological Tests at Brown University. *School and Society*, 10, 27-30, July, 1919.



separately. It seemed best to use for this purpose our two hundred senior students, since for these the point-hour ratio is based upon six semesters' work, and has therefore greater validity as a measure of academic standing. The results are given along with other correlations in Table IV. The correlations vary from .17 in the case of Test 3 to .37 in this case of test 7.

It might be supposed that the relatively lower correlations for tests 1 and 3 are partly due to the fact that these tests are too easy, and consequently not sufficiently discriminative of the kind of ability they aim to measure. In order to try out this supposition, those students who attained percentile rankings on the entire examination of 75 or above were eliminated from our four hundred and thirty-six cases, and correlations between point-hour ratios and scores on each of these tests were determined for the remaining cases (two hundred and ninety). The results were the reverse of those expected. The correlation in the case of Test 1 dropped to .02, and in the case of Test 3 to .07.

In view of the apparent diversity in subject matter and teaching methods, it seemed desirable to determine the correlation between grades and the Alpha examination in certain colleges of the university taken separately. In our sample of four hundred and thirty-six cases there were in all one hundred and six Arts students, eighty-seven Engineering students, and seventy Agriculture students. Product-moment correlations were determined for each of these groups between point-hour ratios and percentile ranks on the entire examination, and also between point-hour ratios and scores on each of the sub-tests separately. The results are given in Table IV.

The most noteworthy point brought out by these results is that the examination as a whole gives a much higher correlation with academic standing in the college of Agriculture than in either of the other colleges. This would be explained, if we assume that the students in the college of Agriculture are more closely supervised, and consequently work nearer the limit of their ability than in either of the other colleges. This is no doubt true of Agriculture as compared with Arts, but in the case of the Engineering students it is certainly not so evident.

If we turn to the correlation for the separate Alpha tests, we note a considerable variability from one college to another. Test 2, Arithmetic, gives the highest correlation with point-hour ratios in the case of Engineering students. This might have been expected from the nature of the test. Test 4, synonym-antonym, gives a fair correlation in the case of Arts and Agriculture students, but zero in the case of

Engineering students. Test 6, number series completion, gives zero correlation in the case of Arts students, and small positive correlations for the others. Tests 7 and 8, analogies and general information, give decidedly higher correlations in the case of students in the college of Agriculture.

These surprising results seem to demand corroboration by correlations with other samples. For this purpose point-hour ratios\* were obtained for all senior students in the colleges of Arts, Agriculture, Engineering and Education. Correlations were then computed as before with percentile ranks on Alpha and with scores on each of the sub-tests. These results are also presented in Table IV. They vary in some respects from those at first obtained; but the findings regarding tests 2, 4 and 6 are corroborated.

It is difficult to draw definite conclusions from these figures. They seem to indicate that tests 1, 3, and probably 6 should be improved or eliminated from the scale if a basis for the prediction of college grades is desired. They also appear to show that tests for university students should be selected and standardized for the various colleges separately; or, that *in addition to a general intelligence test for all students there should be specific tests for the students of different colleges.*

TABLE IV

Correlations between academic standing and army alpha tests

Group	Seniors Random	Agriculture		Arts		Engineering		Edu- cation Seniors	Average
		Random	Seniors	Random	Seniors	Random	Seniors		
No cases.....	200	70	132	106	81	87	135	66	
Alpha scores..	.35	.54	.39	.27	.35	.22	.25	.52	.36
Test 1.....	.18	.17	.21	.14	.08	.10	.05	.32	.16
Test 2.....	.22	.23	.34	.22	-.10	.38	.34	.39	.25
Test 3.....	.17	.28	.20	.15	.19	-.04	.21	.19	.17
Test 4.....	.27	.49	.32	.33	.37	-.16	.26	.55	.30
Test 5.....	.27	.45	.15	.20	.36	.19	.12	.15	.24
Test 6.....	.34	.31	.11	-.01	.05	.15	.28	.40	.20
Test 7.....	.37	.41	.27	.13	.26	.12	.09	.46	.26
Test 8.....	.31	.50	.28	.14	.27	.15	.21	.42	.29





# AN APPROACH TO THE SYNTHETIC STUDY OF INTEREST IN EDUCATION: PART II

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## CHAPTER TWO. THE NATURE OF INTEREST

Interest as a state of consciousness—the first of the three aspects to be considered—is implied by, if not included in, the phenomena of attention. The physiological approach to the study of interest must underlie all other approaches, since “The physiological conditions of the brain’s activities are the first modifiers of feeling and action.”<sup>1</sup> Only so far as the attentive process is understood in its relation to various types of experience can the nature and development of individual interest be explained by the effects of such experience. Both outer stimuli and inner structure are involved. The attentive process must accordingly be considered for two purposes: first, in order to obtain a working conception of interest-attention as depending largely upon environmental factors; and, secondly, to identify various phenomena of interest with physiological processes by which these phenomena are conditioned.

The wide difference of expert opinion as to the distinction between attention and interest is proof that no clear distinction exists.<sup>2</sup> Yet some such distinction is required if environmental stimuli are to be so related to organic processes that the effect of each is apparent in the normal expression of interest. As best suiting this purpose the distinction may therefore be made on the basis of relativity. Such factors of the interest-attention state as are more largely organic and hence constant in their effects upon various normal individuals may be identified with attention. Such factors as are largely environmental and hence variable in their effects may be identified with interest. Attention, thus conceived results largely from nature, and interest from nurture. The former implies the capacity to attend, and the latter the direction of such capacity by the creation of desires and aversions through contact with environment.

This distinction between absolute and relative factors in the same state of consciousness serves the first purpose outlined above by

<sup>1</sup> E. L. Thorndike: “Educational Psychology,” III : 308.

<sup>2</sup> cf. E. B. Titchener: “Psychology of Feeling and Attention,” pp. 294ff. for views of Ebbinghaus, Pillsbury, Stout, and Wundt.

suggesting a correspondence between types of interest and types of attention. Such correspondence is clearly helpful in the attempt to explain differences in mental process as determined by differences in environment. The reference to "types" of attention suggests that the modern *analysis* of the state under the heads of span, concentration, distribution, etc. is to be abandoned in favor of the older *classification*—involuntary, non-voluntary, and voluntary (McDougall), or sensorial and intellectual (James), or emotional and volitional (Meumann), etc. The classification has the advantage in the present instance of including all the factors capable of analysis in addition to other factors implied in a given state and yet incapable of differentiation. The classification accepted by McDougall as above<sup>1</sup> is further useful in that the distinction between types of attention is based on the motor and neural processes involved. The relation of organic structure to environmental differences is thereby greatly facilitated provided that some connection can be established between types of attention and types of interest, the latter to be distinguished by the class of situations or of objects attended to.

The simplest means of arriving at this correspondence between types of attention and of interest is to note the effects of each type of attention in the expression of interest. The course of expression at any stage of development proceeds from a relatively less satisfying state of consciousness and seeks a relatively more satisfying state. The mechanical or motory process of the seeking is attention, and interest yields the feeling of satisfaction or dissatisfaction.<sup>2</sup> Hence it is evident that the distinction between types must depend primarily upon the nature of the object which determines the course of seeking. Certain classes of objects which provoke relatively more intense feelings of satisfaction or dissatisfaction serve also to select those motor processes best able to produce the desired effect. The effects of involuntary, non-voluntary, and voluntary attention may thus be noted as resulting from intensity of stimulus. It is obvious that the distinction between types is rather one of degree than of kind.

The characteristic effect of involuntary attention is fixation, or placing the object in such position that a clearer view is obtained. The physical sub-processes implied result in the better adjustment of the sense organs, movements to or from the object, and instinctive analysis of it. The type is chiefly distinguished by the motor element,

<sup>1</sup> *Mind N. S.*, XI: 319, Note 1.

<sup>2</sup> cf. W. Mitchell: "The Structure and Growth of the Mind," pp. 90ff.



which is reflex or instinctive. The adjustment is entirely effortless and no feelings of inhibition are apparent.<sup>1</sup> This fact justifies the assumption that involuntary attention which persists appreciably beyond the reaction time is commonly aroused only by situations of relatively maximum intensity. Such situations demanding immediate response are referred directly to the instinctive mechanism without risking the delay involved in judgment. This directness of response resulting from maximum intensity of stimulus is also characteristic of the intrinsic type of interest which seeks indulgence in feeling as such. It finds expression in such varieties of interest as are based in qualities of objects that are intense in themselves; as, for example, novelty, contrast, repetition, movement, rhythm and other qualities leading to states of absorption. Involuntary attention and intrinsic interest are both implied in sensori-motor experiment and in response to strong stimuli.

The normal effect of non-voluntary attention is merely a later phase of the fixation process which occurs when the desired state is not promptly attained. This effect has been termed mental manipulation. It consists in a revolving, analysis, and comparison of the situation with others. The ideo-motor process which controls the course of seeking is based on experience of earlier reflex movements. Action involves scarcely more effort than when attention is involuntary. Here again the effect of attention is to provide the means for the realization of interest which in this case seeks a change rendered desirable by previous rather than present experience. Its commoner expressions reveal interest in the overcoming of obstacles. Such interest is properly classified as practical since it includes such varieties as find expression in outer imitation, pursuit, and all forms of rivalry upon which the survival of the organism most directly depends. Intensity is lower than in expressions of intrinsic interest since the course of seeking is less immediately satisfying in itself. Interest in the pure stimulus is greater than interest in the object to be resisted. Thus the simultaneous appearance and scope of both non-voluntary attention and practical interest in all habitual behavior suggests a correspondence between these types.

The effect of voluntary attention is continued scrutiny of the object. Action is impeded by the necessity for selection of the best means from all means available. Neural dispositions resulting from past experi-

<sup>1</sup> Though the factor of inhibition is doubtless involved as suggested by Sherrington: "Integration of the Nervous System."



ence must be successively inhibited. Hence the process might last indefinitely, but for the factor of fatigue and changes in the object itself which may bring relief in action before the difficulty has been solved. In this course of seeking, interest implies the revival of and selection from all relevant ideas that may further the realization of useful knowledge. Such interest may therefore be classified as cognitive or intellectual and said to correspond with voluntary attention. It should however be noted that in cognitive interest the nistic character of the attentive state is of very brief duration. The slow rhythm and fluctuation characteristic of voluntary attention may reduce the intensity to such a point that attention dies,—and with it very frequently the interest. Or else success in solving one aspect of the problem before attention may introduce practical or intrinsic elements to the existing variety of interest which serve to increase the intensity,—often so as to render attention non-voluntary or involuntary. Hence the inhibitory effect of voluntary attention need last only long enough to admit other types of interest.

Otherwise stated, attention to any object or situation provides the means by which one or more types of interest may be realized. Particular sub-processes involved in the course of seeking are selected by the immediacy of response required, which depends upon the intensity of interest determined by the type of experience. The situation may stimulate in order to obtain emotional satisfaction, thus revealing intrinsic interest; or attention may seek to overcome a physical difficulty,—the practical type of interest; or in order to understand the situation for future usefulness,—the cognitive type of interest. It should be further noted that each attitude toward environment, as indicated by type of interest, includes more specific “varieties,” which are later to be considered in discussing the growth of interest. Several such varieties are common to all types of interest,—for example interest in achievement or social superiority, which follows the realization of all interest and is the affective equivalent of organic processes making for self-preservation. Even when inattentive or involuntarily attentive, this interest in achievement consists in the felt attitudes to aspects not attended to and in the exercise of the senses. Ideo-motor non-voluntary attention reveals this interest in successful performance of habitual acts; voluntary attention in the realization of one or more specific interests in the problem. Such specific interests illustrate the shifting of types. Voluntary attention may seek to realize interest in achievement by the possession of fuller feeling and appreciation, *i.e.*,

intrinsic interest; or in a new feeling by assuming a practical attitude toward the object or a different attitude toward itself; or in relief from conflicting feelings by thinking out each side and comparing consequences.<sup>1</sup> The predominant role of this interest in achievement found in impulses largely biological in origin, becomes an interest in personal superiority as the result of social activity. The important psychological implications of resistance to this interest are discussed in a later chapter.

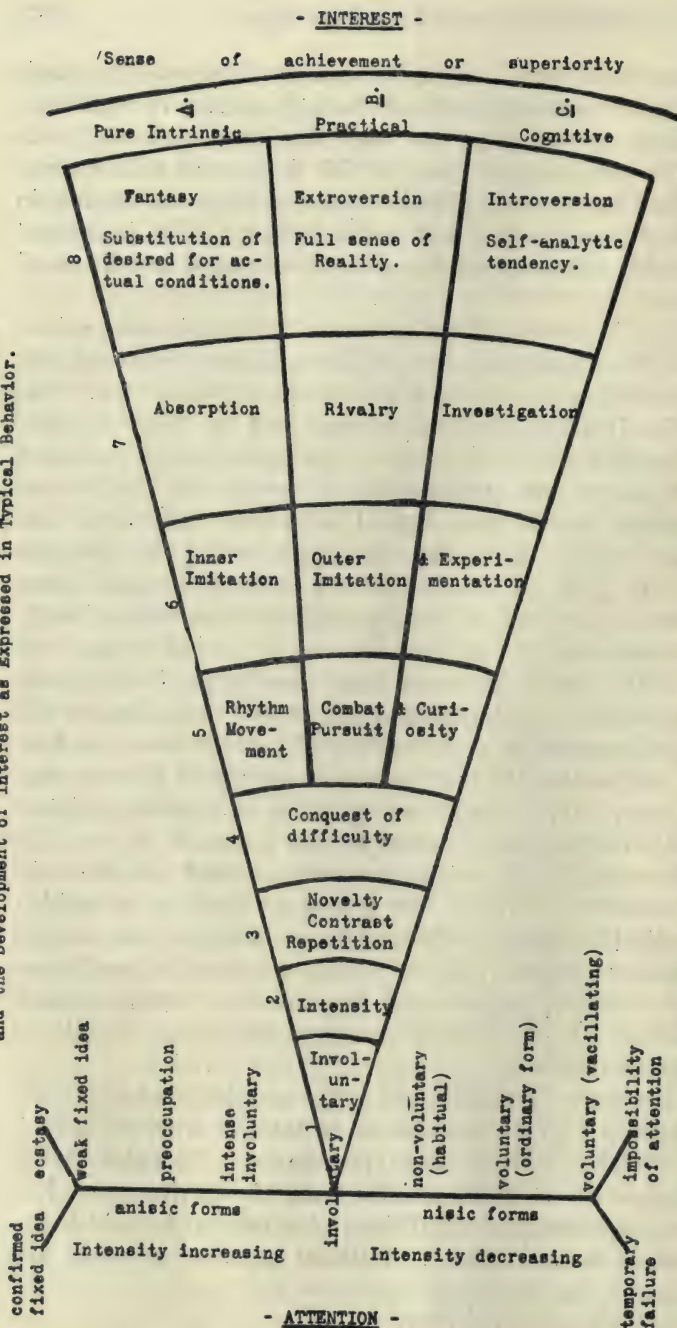
To clarify this discussion of the nature of interest as determined largely from without and hence to facilitate future reference, the substance of preceding remarks is represented in Figure One. The scale of attention is arranged about as suggested by Ribot<sup>2</sup> to illustrate the graduated intensity of types. The relationships indicated in the chart of interest are substantially in accord with the facts as recorded by group studies and logical inference. The clear distinction between types shown by the segments of the diagram postulates a pure type of interest, which seldom occurs. Later analysis will reveal a margin of overlapping which serves to justify the apparent restriction of cognitive interest to attentive states of low intensity. The figure becomes more intelligible if the three segments are regarded as composing a fan, which may close to the width of any one segment or open to the width of all three—as here shown. This emphasizes the fact that each variety of interest may occur in all types. For example, when a boy is sufficiently interested in the glitter of a piece of metal to pick it out of the mud, his interest may lie wholly in the response to strong visual stimulus—the gleam—and is therefore intrinsic. Or it may be the hope of sudden wealth—a practical interest. Or it may be curiosity to learn why it gleams—a cognitive interest. In each case the reaction and hence the function of attention *depends upon the intensity of interest regardless of type*, though the theoretical correspondence may usually be justified in a given instance.

Passing to the second consideration of the physiological approach, we have to identify various phenomena of interest with physiological processes which condition these phenomena. In other words it is necessary to shift the point of view from the environmental to the organic and neurological conditions of attention by which the growth of interest is determined. Without pausing to relate the

<sup>1</sup> cf. W. Mitchell, *op. cit.*, pp. 95, 98.

<sup>2</sup> "Psychology of Attention," pp. 110ff.

Figure One. Illustrating Correspondence between Types of Attention and Interest and the Development of Interest as Expressed in Typical Behavior.



**Explanation:** Vertical scale indicates degrees of intensity of attention.

Segments A,B,C indicate types of interest which in pure form may be considered to vary in degree of intensity somewhat as indicated. Attention is labored in purely abstract thought and intense in purely aesthetic feeling, etc.

Arms 1,2,3, and 4 indicate varieties of interest, i.e. general forms of expression, which occur in any type. Arms 5,6,7, and 8 indicate varieties which tend to seek expression in appropriate types, thereby modifying the intensity of attention by causing the types to overlap. Such types are of course distinct only in abstraction; the expression of interest is normally distributed through various forms of behavior of which the above are merely typical.



many subsidiary factors of attention to the phenomena of interest,<sup>1</sup> it is well at least to mention those processes whose genetic development serves to explain stages in the development of interest. Such universal forms of expression as are mentioned in connection with the growth of interest (Chapter Three) will thus imply the physiological conditions characteristic of each stage of development. For this purpose a most casual reference will suffice.

Assuming familiarity with the treatments of Baldwin, Thorndike, and Wundt, we may postulate three stages of interest and suggest under broad headings the physiological factors most characteristic of each. As commonly distinguished<sup>2</sup> these stages are assigned roughly to the years birth to 9, 9 to 13, and 13 to maturity. The first may be termed experimental, implying interest in sensory and motor exercise for its own sake or for relatively insignificant ends. The second, or imitative stage, marks the appearance of aggressive and defensive social interests that show native biological tendencies in partial conflict with environment. The third or reflective stage, while of course including the features of the earlier stages, shows the individual largely identified with certain ends. Such interests may be said to have become habitual. While the expression of all interest is normally distributed over the range of development indicated by the three stages, these periods determined by the notion of neural arcs are helpful for purposes of classification.

The physiological basis of interest-attention may be referred to the combination of organic and neural processes. The organic must here be largely disregarded, yet their role in the effective expression of interest is fundamental. Motor, respiratory, and vaso-motor phenomena are essential constituents of every state. The genetic development of these organic processes is implied by capacity for rational choice, which involves conscious control of motor processes and to some extent of the respiratory. In a word, the stages of interest are marked by the appearance of various forms of movement. Reflex and instinctive, ideo-motor, and voluntary movements develop successively and imply greater capacity to profit by experience, as suggested in the preceding discussion of type. Since all forms of attention must appear in each stage and develop concom-

<sup>1</sup> McDougall offers a list of fifteen such factors which might profitably be so related. *Mind. N. S.*, XII: 317-8.

<sup>2</sup> By Adams: "Exposition and Illustration in Teaching," p. 54; Baldwin "Mental Development: Social and Ethical Interpretations," pp. 362ff; Croswell *loc. cit.*; et al.

itantly, the course of motor development toward voluntary inhibition is closely parallel. Certain reflex movements are valuable aids in the diagnosis of unconscious interest. Others by mere expenditure of energy facilitate attention indirectly by arousing the motor centers, and directly by adjustment of the sense organs. Instinctive movements combine a series of reflex movements in a certain order which the ideo-motor process connects with an idea of the situation as a whole. Hence the effect of the movement upon the impression or idea is the important one of reinforcement by innervation. The idea can be more clearly distinguished if the related movement is actually made. The inhibitions of voluntary movement are likewise explained as the omission to reinforce ideas with undesirable associations. Such inhibitions involve the uncertain relation of interest to fatigue. The remark is probably safe that the degree of general fatigue inhibited varies directly, but within narrow limits, with intensity of affective tone.<sup>1</sup> Respiratory processes, as determining in part the distribution of attention, develop similarly. The vaso-motor process, as regulating with other factors the supply of blood to the brain, determines also the intensity of the attentive state and is an important condition of definite association and reinforcement. As related to affective states these phenomena are perhaps most conveniently discussed by W. H. Howell's *Physiology* and the briefer treatment of F. Arnold's *Attention and Interest*.

Any adequate discussion of the neural process as determining the nature and growth of interest requires that recent conflicting theories of the apperceptive process be analyzed in the light of the most reliable behavioristic evidence. Such analysis is impossible here. Yet the nature of the inquiry may be suggested by the selection of the three widely accepted principles which McDougall declares to constitute the indispensable basis of physiological psychology; namely, the specific energies of sensory nerves, strict localization of cerebral functions, and the principle of association.<sup>2</sup> On the basis of these principles and their implications, the specific energies, *i.e.*, tendencies resulting from sensory or ideational stimulus, must occur in "the specific constitution of structural elements of the cerebral cortex that are capable of becoming associated together

<sup>1</sup> cf. Thorndike, *op. cit.*, pp. 120f. and C. S. Myers: "Introduction to Experimental Psychology," p. 107.

<sup>2</sup> "Introduction to Physiological Psychology," pp. 58f.



when thrown into simultaneous action.”<sup>1</sup> The organization of these elements in functional groups, by which the nervous system evolves, is believed to consist in the formation and perfection of synapses which therefore determine both the direction and intensity of interest. This leads to a preliminary statement regarding the relation of feeling and knowledge, that intensity of the psychical process varies inversely with the complexity of neural organization, or knowledge. Psychical activity results when the resistance of the synapse to the neural current is high because of the novelty or infrequency of such currents—hence the affective value and interest in strong and unusual stimuli, surprise, etc. When the resistance of the particular synapses has been diminished by the frequent passage of the impulse, the intense psychic effect no longer appears. By voluntary reinforcement, however, impulses may be so directed through the complex systems of high intelligence that neither the resistance nor the resulting intensity is appreciably reduced. In this case the reinforcement merely functions with greater economy.

As distinguishing the hypothetical stages of interest and resulting from the successive development of neural arcs in systems of increasing complexity, three forms of reinforcement are implied: instinctive reaction to pleasure-pain, direct reproduction of neural systems associated by temporal contiguity, and divergent reproduction of such systems through derived associations. Certain implications of each form affecting the expression of interest may be briefly noted.

Highly stimulating objects, whether novel or sharply contrasted with the object in consciousness, can compel attention at all ages. In earliest childhood such objects produce and perfect the reflex movements whose control serves later to reinforce complex movements of the ideo-motor variety. Yet the state of involuntary attention resulting almost entirely from organic factors, in which they first appear, is without ideal reinforcement and consequently of very brief duration. Some form of reinforcement must exist to explain the tenure of such objects for even the fixation time, and this is found in sensations of pleasure-pain. Reinforced by such sensations—whether of sight, sound, taste, movement, et al.—attention persists and reveals the forward reference tendency apparent in higher forms of interest. In the case of mere sensory stimulation, the fact of attention may be ascribed to interest in the exercise of the organ stimulated. The stage of interest in such phenomena is accordingly quasi-organic or

<sup>1</sup> *Ibid.*



experimental. It is distinguished by the vagueness or absence of conscious aim.

Attention resulting from the factors of the cerebral level implies preperception, the ability to identify the object before consciousness with a mental image gained from former experience with it. Here the reinforcement results from association by temporal contiguity, which McDougall states "is the one and only form of association that can be explained physiologically."<sup>1</sup> Attention to any one element of the ideal disposition tends to reproduce the whole of a former experience. Selection from incoming impressions is guided by the reinforcement of such impressions as are almost entirely familiar. The constellation of mental states before the situation has entered consciousness seeks control by diffusion of energy in the direction suggested by the most familiar element in the situation. Suggestion is particularly potent in the direction of interest because of the ease with which familiar elements are dissociated. Likewise imitation of other's acts and reproduction of the child's own activities direct interest very largely and cause certain relationships to be taken-for-granted, thereby increasing the scope of interest. The stage implied by these processes may be termed the imitative or social stage as indicating tendencies to reproduce familiar experience. It is distinguished by complications of experimental interest resulting from social relationships. The characteristic aim is social superiority.

Reinforcement of voluntary attention is due largely to the complex interrelations in the neural systems of the frontal areas. The afferent impulse, instead of reproducing readily the constellations associated with it in time, diverges into a number of sub-systems related to the constellation. A conflict of tendencies results which can be resolved only by conscious deliberation. This successive inhibition of various means continues until an element of experience is revived which contains the solution or until the search fails. In the former case intermediate elements are referred to the ideo-motor processes and reinforced by temporal associations. In the latter case, the search is abandoned until the mind is recalled to the dilemma by dissatisfaction in the failure to control. In affective terms, the distinguishing feature of the process is desire for control through closer contact with reality as represented by previous experience. Expression of interest in this deliberative stage is characterized by mediation

<sup>1</sup> *Op. cit.*, p. 135.

between organic impulse and rational judgment. Sacrifice of either results in a repression of interest, the subject for a later discussion.

F. M. Alexander's recent work, *Man's Supreme Inheritance*, suggests that the phenomena of repression result from dissociation of the 'higher' from the 'lower' nervous centers. The implication is clearly that integration of neural function is essential to the most effective expenditure of effort, and the normal distribution of interest which such expenditure implies. Hence the deliberative stage of interest is distinguished by the variety of attitudes in which interest may find expression because of the numerous constellations in which thought of the given situation may occur. It is also marked by the tendency to act in certain interests which have become habitual.

In summary, it may be observed that the reference to certain more prominent physiological factors of interest has been developed by the three-fold classification proposed (Chapter One, 4). Under these heads both external and internal conditions are related to the most conspicuous phenomena of interest in such manner as should best help the discussion to follow. Abstract and rather arbitrary classification is necessary in order to emphasize common elements in various explanations of the same phenomena, hence none but the most general features are examined. Otherwise it would be possible to select from the wide field of studies to determine variations in the behavior of individuals and groups which this discussion is forced largely to ignore. From the evidence at present available the chief characteristic of such mental variations is their continuity. The intermediate stages are far commoner than the extreme types. Variations in the development of interest, perhaps the least constant of all mental traits, can therefore be recorded only within the limits of general tendencies.

### CHAPTER THREE. DEVELOPMENT OF INSTINCTIVE INTEREST

The science of genetic psychology postulates that mature behavior is largely traceable to original instinctive endowment. Behavior at various stages is explained by reference to the stage preceding. It is clear, however, that such explanation is as yet by no means complete, nor can it be until an inventory of native traits is made to tally at all points with the main tendencies of later conduct. Pending scientific selection and description of such traits and tendencies, this complete explanation is clearly utopian. One is thus forced to rely upon



opinion both in selecting instinctive traits and in distinguishing those later tendencies which the traits serve to explain. The abundance of expert opinion regarding continuity of instinctive development must be sifted by the most reliable evidence available, which is probably to be found in the many accurate descriptions of particular responses under various prescribed conditions.

Waddell states in this connection: "It is self evident that most of the interests are conditioned directly by instinctive emotional complexes. We cannot understand or anticipate interests, then, without an understanding of their inborn correlates."<sup>1</sup> For this reason it is easier to identify and classify the more constant varieties of interest when the behavior examined is closely restricted to activities of biological origin, for here conformity is greatest. Yet it is important that this approach should not obscure the distinction it is intended to emphasize; namely, the distinction between the instinctive basis itself as inferred from the child's responses and later interest-behavior which includes other than instinctive elements. The instinct for mere motor activities, for example, while explaining the fact of interest in movements does little to explain the nature of such interest as determined by the various ends sought. Yet the more nearly certain broad classes of interests, such as are indicated by the types before described, can be related to universal tendencies of instincts, the easier is it to mark off broad types of behavior in which related varieties of interest can be identified. To assist this relation of interest to instinct, the present discussion ignores social and other environmental elements of interest so far as possible, by considering only such expressions as occur in solitary play. Of these the most useful accounts are probably found in such familiar works as Chamberlain's *The Child*, Groos' *The Play of Man*,<sup>2</sup> and Preyer's *The Mind of the Child*. More particularized, and somewhat more scientific accounts of special forms of play are equally familiar in the various child-study publications. It is unfortunate that space forbids any description of evidence upon which a conclusive study of instinctive interest must rely. For this the reader is referred to certain original sources which illustrate the method of approach herein described.

This restriction of the field to largely non-social behavior is helpful in confining the discussion to interests of the experimental stage. It has

<sup>1</sup> "Child Psychology," p. 112.

<sup>2</sup> Pp. 7-118 of this work are closely followed in the remaining discussion of this chapter and pp. 173-334 in that of the chapter following.



however the disadvantage of excluding the phenomena of imitation appearing in the same period of development, which are reserved for later treatment as explaining social modifications of instinctive interest.<sup>1</sup> Experimental interests find fullest expression in play for the reason that playful activities are performed *per se*. Their relation to instinctive tendencies is therefore most close. Hence differences in type of instinctive function may serve to distinguish corresponding forms of play in which the type of interest is determined most directly by the instinctive function. Related varieties of interest can most readily be identified in these forms of play because of their development from a common instinctive source.

In most general terms, these types of instinctive function are two, the sensory and motor. By attaching sensory qualities to various objects instinct facilitates the satisfaction of organic needs,<sup>2</sup> and these responses to agreeable stimuli soon constitute the primary form of conscious play. The feeling of satisfaction or dissatisfaction is the source of all interest which later includes the progressive forms of feeling, affect, impulse, and desire.<sup>3</sup> Playful sensory exercise may thus be selected as the form of behavior which results most directly from interest of the intrinsic type, and the various qualities possessed by the stimuli of these sensations may accordingly be regarded as varieties of such interest. Instinctive motor activity of a sort is implied in all sensations, which reveals an "instinctive manipulation of things, movements to or from them, persistence against obstacles, and the restlessness that goes with a sense of want."<sup>4</sup> The pleasure of kinesthetic sensation soon produces such movements playfully as ends in themselves together with playful movements of foreign bodies. This second form of play is the logical province of experimental practical interest. In addition to these instinctive functions, a third may be predicated to account for the playful exercise of mental powers that reveals an experimental cognitive interest. This function first appears in the instinctive adjustment of sense organs to secure a fuller sensation. Its later activity in such plays as require the exercise of attention, imagination, and reason, as in guessing games, etc. is sufficiently great to justify the third division. These three progressive forms of play activity thus closely related to distinguishable instinctive

<sup>1</sup> I.e., the transition from private to public interest, cf. Baldwin, *op. cit.*, p. 503.

<sup>2</sup> cf. W. Mitchell: *op. cit.*, p. 194.

<sup>3</sup> Wundt: *Philosophische Studien*, 6: 380.

<sup>4</sup> Mitchell, *op. cit.*, p. 105.

functions and clearly evident in all children's behavior require further brief comment in turn. The purpose of this comment is to indicate hypothetically the conclusions which a truly scientific study of instinctive interest might reach both as to the gradual differentiation of types of interest in this behavior and the more conspicuous varieties in each type.

The conspicuous varieties of intrinsic interest may be supposed to extend from undifferentiated pleasure-pain sensations through such qualities as intensity, novelty, contrast, movement, repetition, rhythm,—and to culminate in states of aesthetic absorption.<sup>1</sup> While the order is mainly conjectural, it is supported by such accounts of progressive response to the various sensations as is offered by Groos. Intensity, novelty, and contrast are qualities which serve to explain expressions of interest in all sensations but chiefly in those of contact, sight, sound, and smell.<sup>2</sup> Movement is of course here confined to visual sensations and results from the biological importance of attention to changes in environment. Interest in repetition appears chiefly in productive sound sensations. Rhythm as observed in the movements of others is interesting on account of the muscular innervations involved. Rhythmic sounds, from the watch-tick to band music, and melody at about four years, both excite a lively interest which is due largely to mild hypnosis.<sup>3</sup> In absorption this phenomenon is more apparent and is treated elsewhere in connection with inner imitation.

The gradual transition to the practical type may be illustrated by interest in the production of vocal sounds. From the mere acoustic sensation interest develops in overcoming the difficulty of articulation. This evolution of motor from sensory interest is typical of all playful behavior. From this point the normal varieties of practical interest may be tentatively listed as conquest-of-obstacles, control, pursuit, combativeness, outer-imitation or reproduction, and rivalry,—all culminating in achievement of highly particularized nature which is characteristic of all practical interest. As best expressed in playful bodily movements and movements of external objects, interest in conquest-of-obstacles appears in early attempts to sit, stand, or walk.

<sup>1</sup> Absorption is here interpreted as originally defined by Th. Lipps: *Zur Einföhlung*, Leipsig, 1913. It implies absorption in the stimulus, not with the stimulus as in the fixed idea.

<sup>2</sup> cf. Preyer: *op. cit.*, Chapter I.

<sup>3</sup> cf. Gates: "Musical Interests of Children," *Journal of Pedagogy*, 2: 265-284.



This comes rapidly to include control and pursuit motives<sup>1</sup> as in passive movements of coasting or in runs, hill-climbing, and hide-and-seek games.<sup>2</sup> Interest in control often renders such vocations as seaman-ship, fire fighting, and horse racing most attractive during the years 9-13.<sup>3</sup> Combative instincts bear much the same relation to interest in many forms of destructive or analytic play as outer imitation bears to constructive interest in mud-pies, snow-men, and even in collections.<sup>4</sup> Rivalry is evident in such collecting as in all behavior at the appropriate age. Its treatment as allied with interest in superiority is deferred to the later discussion of social interest. On the whole this relation between intrinsic and practical interest suggests the biological explanation of a familiar fact; namely, that motivation consists in the response to intrinsic stimulation which provokes voluntary effort toward a desired end. Such effort is rendered efficient by practical interest in achievement.

Experimental varieties of cognitive interest, as appearing in playful exercise of mental powers, may occur in recognition, expectancy, reproduction, reconstruction, curiosity, experiment, and—less clearly observed at this stage—investigation and judgment. As Kirkpatrick states, "If interests depended only upon the biologically useful instincts, there could be but little development of intellectual interest."<sup>5</sup> Yet it is only by instinctive exercise of mental powers in expression of practical interest that capacity for the so called "higher" interests is developed. Interest in the "warmth and intimacy" of mere recognition and also in expectancy may be termed wholly instinctive.<sup>6</sup> The memorizing and reproduction of nonsense syllables, etc. is largely of practical interest in the mere achievement, though some cognitive interest is implied. Interest in playful use of the imagination appears in reconstruction of past experience for indulgence in all forms of make-believe, as in stories told by and to children.<sup>7</sup> Curiosity, while at first seeking novel impressions rather than meaning for later use, marks the rise of real cognitive interest in the exercise of reason.<sup>8</sup>

<sup>1</sup> "No activity is interesting unless it follows the pursuit pattern," Jennings: "Suggestions of Modern Science," p. 164.

<sup>2</sup> cf. J. Lee, *op. cit.*, Chapter 26.

<sup>3</sup> cf. Crosswell, *op. cit.*

<sup>4</sup> cf. Groos, *op. cit.*, pp. 99ff. and Burk "Children's Collections," *Ped. Sem.*, 7: 179-207.

<sup>5</sup> "Individual in the Making," p. 18.

<sup>6</sup> Groos, *op. cit.*, p. 125, finds humor resulting from impeded recognition.

<sup>7</sup> J. Lee, *op. cit.*, *passim*; Barnes: "Studies in Education," I and II.

<sup>8</sup> cf. J. Welton: "Psychology of Education," p. 209; and Henderson: "Principles of Education," p. 254.



In plays with riddles, puzzles, tormenting animals, etc. interest passes from the post hoc to the propter hoc<sup>1</sup> and still later to plays with the feelings as in games of self-control and endurance and also in ghost stories.<sup>2</sup> Purposeful investigation and judgment involving higher physiological development need merely be mentioned as later forms of cognitive interest. The significant feature of cognitive interests is their brief duration in the pure type. When once expression is fairly under way other elements enter in to render the interest practical or even intrinsic.

These instinctive or experimental varieties of interest expressed in comparatively universal forms of behavior are next to be considered in their social complexity—as modified by processes of environmental adjustment.

<sup>1</sup> Davis: "Interest in the Causal Idea," *Child Study Monthly*, 2: 226.

<sup>2</sup> Groos, *op. cit.*, pp. 169ff. and Brewer: "Instinctive Interest in Bear and Wolf Stories," *Amer. Ass'n. for Advance of Science, Proceed.*, XVII.

## JUDGMENT OF RELATIVE VALUES

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A sense of relative values is essential to the judgment process. "Unconscious premises," the precipitate of previous experience, are required in every complex judgment. These unconscious premises serve to weight the various factors which are pertinent to the problem under consideration.

Judgment in one form or another has been measured by a large number of the so-called mental tests. Bonser, Herring, and Cyril Burt, have done direct work on certain phases of the question. In the common sense test of the army intelligence examination, the procedure is to propound a question, to which four alternative answers are given. For subjects above a certain mental age, one of these answers usually is obviously correct, and the other three are often absurd. Under these conditions, the measurement of the sense of relative values is distinctly crude; the test can hardly be said to give any knowledge of the finer sense of relative values upon which judgments in history, civics, geography, literature and every-day living depend. In these last named, it is usually not a matter of one reason being right and the others wrong—the task is much more to decide, among a number of reasons, what must be the degree of importance attached to each. Thus, for example, in considering a question such as the value of capital punishment, upon which sophomore genius has spent itself, the problem is not to decide that one reason is correct, and all the other reasons are incorrect, so much as it is to compare each reason with the other reasons, in an attempt to estimate its worth. In observing instruction in the higher grades, the author has been much impressed by the frequency with which the problem under discussion calls for this type of mental activity. On many occasions a pupil will give as a reason for a certain action or a certain state of affairs a reply which can be called neither right nor wrong. The reply has value and is a partial explanation, but its value is small compared with other reasons which the pupil himself is capable of giving, when pressed. The pupils seem to be moderately fertile in suggesting reasons. What is apparently lacking is either the disposition or the ability to weight the value of the various reasons. This phase of mental activity seems to be of sufficient importance to warrant considerable investigation. The object of the present

research is to obtain some information which will throw light on this complex type of judgment, a type of judgment perhaps more essential to success in life than it is to success in the present-day school.

In the common-sense test of the army intelligence examination, the scale of reasons given may be called discontinuous, in the limited sense that one reason is tolerably sound and the others more or less absurd. The general method of procedure in this study was to substitute for this discontinuous method a more continuous series of reasons, having all degrees of relevancy, from a high degree of validity to such low degree as to be absurd. For this purpose it was necessary to construct, for a number of topics, what virtually amounts to rough scales of relevancy, a process which has been made familiar by the construction of handwriting, drawing and composition scales.

A number of topics were selected, which, from their general nature, would be reasonably within the scope of elementary school-children, of Grade VI to Grade VIII. From a large number the following three topics were eventually chosen.

1. Reasons for Going to High School.
2. Reasons for Reading Good Literature.
3. Reasons for Saving.

The final selection of samples forming each scale follows:

The process of forming the scales for each of these topics will be made evident by considering in detail the method of developing the series called, "Reasons for Going to High School."

#### RELATIVE VALUES IN READING

##### *Reasons for going to high school*

- A. One must not forget the lectures which are occasionally given in high school by prominent men, such as ministers, politicians, and educators; these often grip a pupil's mind and help him to decide his purpose in life.

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- B. Many high schools have pennants, trophies and pins, quite apart from the graduation diploma itself, without being in high school one cannot have these valuable things to show to neighbors and friends, both during high school and in after life.

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- C. One must find something to do to occupy the time; since the high school course keeps one so well occupied, every boy and girl should without fail attend the whole of the four year period as regularly as possible.

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- D. From the purely monetary point of view, it pays to attend high school; no individual can earn to the full extent of his capacity, if he has merely the resources which are given by an elementary education.



- E. A high school education teaches one to co-operate, and to adjust one's self to others; it teaches one to keep one's own individuality and at the same time to show a proper respect for the opinions of others.
- 
- F. If one does not go to high school one is apt to disappoint the teachers with whom one has worked; this should be the last thing any pupil should dream of allowing to happen.
- 
- G. While the elementary school gives the tools of learning, the good high school goes further, for it teaches the sound use of the mother tongue, the habit of reflection, the power to grow, the art of transferring thought into action, and last but not least, refined and gentle manners.
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- H. Many boys and girls would have no systematic physical exercise whatsoever if they did not attend high school where physical training is compulsory; for this reason alone they should try to attend for the four year period.
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**"Reasons for Going to High School."**

Sixty undergraduate students handed in five reasons each, so chosen as to range from a good reason to what would appear to an adult to be almost a stupid reason. Each student graded his reasons, according to his own judgment, from one to five. From the large number of roughly graded samples thus secured, thirty, which represented all degrees of relevancy, were selected. These thirty were then given to a small group of competent persons, for ranking. On the basis of this ranking, the number of reasons were reduced to sixteen. The criteria of reduction were

1. small variability in rank assigned.
2. reasonable differences in ranking, of the related specimens.
3. wide range of relevancy in the series.

These sixteen reasons were then arranged in a random order, and a group of sixty undergraduate students was instructed to rank them. On the basis of this ranking, eight samples were finally selected, according to the above three criteria; that is, samples were chosen (1) which exhibited small variability in their rankings, (2) which were fairly equally spaced in the sense that on adding up the totals formed by the ranks there was, for this particular group, approximately the same difference in totals. This does not mean, especially at either end of the scale, that the differences in relevancy are equal from passage to passage. To get such equal differences would be a great labor. We may say, however, that for the purposes of this investigation, the series is sufficiently graded to accomplish

its purpose. Owing to the loss of part of my material, I am unable to present the original data on which the rankings with the various topics were made. Fortunately the orders, which resulted from this work, were not lost. To verify the approximate accuracy of these orders, I have secured subsequently a rating by ten to thirteen competent judges, and their agreement with the previous, more complete rankings is sufficient to show that the original data are reliable enough for the limited objectives of this study.

#### RELATIVE VALUES IN READING

##### *Reasons for saving*

- A. People who save are able to take advantage of unexpected business opportunities which demand ready money if they are to be seized.

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- B. A man is not considered successful unless he has a good deal of money in reserve; we must save money to give us standing among our neighbors.

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- C. There are always in every place the poor who are living at the point of starvation; if we save money we can help this struggling class.

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- D. Later in life when old age comes and it is no longer possible to work, savings provide a steady income and ensure independence.

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- E. With the saving of money it becomes advisable and usually necessary to have a bank book; the possession of a bank book is a source of genuine pride.

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- F. A man who has saved is largely independent of his fellow men. He no longer needs to co-operate in the earning of his living but can take up an independent attitude in which he need have no consideration for those around him. Even though men hate him he can buy their services.

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- G. One should save money during the year so that when the vacation comes, one may go to a fashionable summer resort and appear to be very wealthy.

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- H. Ill health may come at any time in a person's life; this possibility demands that we put by enough money to draw on in such a need.

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- I. It often happens, through no fault of one's own, that one loses one's position; it is necessary to have money to tide one over until one finds another opening.

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- J. All people are liable to sudden unexpected expenses; if there are no savings on which to fall back, it is very easy to run into debt.

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- K. To have an expensive funeral is a very fitting end of a life; without savings such a funeral is impossible.

- L. One of the good reasons which prompt people to save is found in the desire to leave money and property to those who come after.

RELATIVE VALUES IN READING

*Reasons for reading good literature*

- A. Unless one has a wide acquaintance with the English tongue it is almost impossible to write accurate and concise telegrams; seeing that these messages are both urgent and expensive we have another argument for good reading.
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- B. Literature, by revealing to us the great achievements and longings of mankind, excites us to self activity, it furnishes our ideals and creates the energy with which they may be pursued.
- 
- C. Even if for no other reason the pleasure which comes from handling books, observing their various forms, their different textures, their multiform bindings, would compensate the reader for the time that he spent in wide reading.
- 
- D. A wide acquaintance with good books enables us to understand the literary references which are so common in the newspapers and weeklies. Since these journals contain the news of the world it would seem very desirable to read good literature.
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- E. The reading of good literature gives a mentally healthy attitude, makes life take on new colors, reveals romance in everyday things, thus contributing greatly to the satisfactions of life.
- 
- F. The habit of reading good literature is the mark of the educated man; whether one enjoys reading or not, it is valuable to read widely and thus imitate the habits of the educated for others will think we belong to this class.
- 
- G. Wide reading of the best literature gives us an insight into the great world outside ourselves, opens up wide fields of interests, and gives us a power to meet the problems of today.
- 
- H. A bad deed can often be made to appear reasonable and fair, if it is accompanied by well chosen words. Good literature provides the vocabulary and fosters the power with which to cover such deeds.
- 
- I. In the writing of letters, both of a business and a private nature, the advantages of a free and easy style are great; these advantages are likely to be derived from the constant reading of good books.
- 
- J. A mind acquainted with the thoughts of the master minds of literature is in an excellent position to make sound judgments with regard to the perplexities of its own time and age.



In Tables I, II, and III will be found the ratings, made by the subsequent judges, compared with the average rating, given by the larger group. This last named ranking is shown in the last column but one. The average deviation is shown in the last column. It

TABLE I  
Value of high school education

Judge Reason	Rankings by competent judges (check group)													Rating by larger group	A. D. of check group
	1	2	3	4	5	6	7	8	9	10	11	12	13		
A	5	5	5	5	4	3	4	5	3	4	3	3	5	4	.8
B	8	8	8	7	7	8	6	8	8	8	8	8	8	8	.3
C	6	6	7	6	5	6	7	6	6	5	6	6	7	6	.4
D	3	3	2	3	3	2	3	3	4	3	4	4	4	3	.5
E	2	2	3	2	1	4	2	2	2	2	2	2	2	2	.3
F	7	7	6	8	8	7	8	7	7	7	7	7	6	7	.4
G	1	1	1	1	2	1	1	1	1	1	1	1	1	1	.1
H	4	4	4	4	6	5	5	4	5	6	5	5	3	5	.7
Value of $\rho$	.98	.98	.93	.95	.93	.93	.93	.98	.98	.98	.98	.98	.89		

TABLE II  
Value of reading good literature

Judge	Rankings by competent judges (check group)													Rank- ing by larger group	A. D. of check group
	1	2	3	4	5	6	7	8	9	10	11	12	13		
A	7	8	7	9	7	9	9	7	8	7	7	7	8	7	.7
B	2	3	3	3	4	1	1	1	1	1	2	1	3	2	.9
C	10	9	10	7	8	7	7	9	7	8	8	9	7	9	1.2
D	5	5	5	6	6	6	5	6	6	5	5	6	5	6	.5
E	4	4	4	4	2	4	4	4	3	4	3	4	4	4	.3
F	8	7	8	8	9	8	8	8	9	9	9	8	9	8	.5
G	1	1	1	2	3	2	3	2	2	3	1	2	1	1	.8
H	9	10	9	10	10	10	10	10	10	10	10	10	10	10	.2
I	6	6	6	5	5	5	6	5	5	6	6	5	6	5	.5
J	3	2	2	1	1	3	2	3	4	2	4	3	2	3	.8
Value of $\rho$	.97	.95	.96	.92	.90	.94	.92	.98	.94	.94	.97	.98	.94		

TABLE III  
Reasons for saving

Judge	Rankings by competent judges (check group)											Rating by larger group	A. D. of check group
	1	2	3	4	5	6	7	8	9	10	11		
A	4	3	5	4	5	5	3	5	5	5	5	5	.5
B	8	8	9	7	9	9	8	8	8	8	10	9	.7
C	6	4	6	8	7	4	5	6	6	7	7	6	.9
D	1	2	1	1	1	1	2	1	1	1	1	1	.2
E	9	12	8	9	6	7	11	12	10	9	9	8	1.8
F	10	10	10	10	10	10	10	9	12	10	8	10	.5
G	12	9	11	11	11	11	9	10	9	11	11	11	.7
H	2	1	2	2	2	2	1	2	2	3	2	2	.3
I	3	5	4	3	3	3	4	3	3	4	4	4	.6
J	5	6	3	5	4	4	7	4	4	2	3	3	1.4
K	11	11	12	12	12	12	12	11	11	12	12	12	.4
L	7	7	7	6	8	6	6	7	7	6	6	7	.5
Value of $\rho$	.95	.84	1.00	.93	.97	.97	.87	.92	.93	.98	.97		

will be seen that although the second group of judges does not by any means agree absolutely with the larger group, the discrepancy is not sufficient to affect the purposes for which the scales are used.<sup>1</sup>

Given these series and their approximate order of ranking by competent judges, they can obviously be used to test the sense of relative values or judgment of any other group. Owing to the unreliability of ranking of any one series, by a particular subject,<sup>2</sup> if any attempt is made to employ them for individual diagnosis, a variety of series must be used. In this study, however, the scales are used merely for group examination.

#### METHOD OF EXAMINATION

The sheets, in the form already shown, were distributed to the group under examination, together with a report sheet, and a larger piece of paper for making notes. The pupils were told to read the samples over three or four times, making as careful notes as they cared

<sup>1</sup>The bottom line of the tables shows the value of the correlation by rank square difference methods of each judge with composite ranking.

<sup>2</sup>For pupils of Grade VIII the correlation between rankings of two topics is not more than .3.

to, with a view to ultimately arranging them in their order of relevancy. Numerous illustrations were used, to make the idea of ranking obvious. At the close of the explanations, the author, who conducted all the tests, usually asked three or four pupils, selected at random, to explain just exactly what they had to do. It will be noticed that each reason has a key-letter attached to it. The pupils represented each sample in their ranking by the key-letter. The letters were arranged therefore in a vertical column, the pupils writing "best" opposite the top one, and "worst" after the bottom one. Usually, from fifteen to twenty-five minutes was necessary. No pupil was hurried. In very few cases was there evidence of pupils making careless or indifferent judgments. Rarely before the end of fifteen minutes was any pupil ready to hand in his order as final.

Another fact, interesting to note, is that even where a pupil's ranking of a sample deviated markedly from the probable order, in nearly all cases he had a reason, however inadequate, for his decision. Those who witnessed the experiment in progress agreed that the test was performed under the best conditions to admit of a pupil showing what sense of relative values with regard to these particular topics he possessed.

The following factors insured this:

1. the reasons were explicitly stated and did not have to be "thought up" by the pupil.
2. a much greater time was allowed for the decision than is allowed ordinarily in school for judgments of this kind.
3. there was no call for writing or for expression of ideas, which often complicates the ordinary process of judgment.
4. the topics were more within the experience of the pupils than many discussed in literature, history, civics, etc.

The general argument is that if, under these conditions, in many cases poor judgment is shown, it is easy to infer the quality of judgment that may be expected in reference to the complex factors of a distant period in history, etc., etc., or in affairs which are as remote from the pupils' experiences as are, necessarily, many of the topics taught in school.

The three tests were given to various groups from Grades VI, VII, and VIII. The pupils were chosen alphabetically to prevent selective influences. The results of applying the first test (Reasons for Going to High School) to a group of approximately thirty-two pupils in Grades



VI, VII, and VIII are shown in the tables IV and V. Horizontally, the various reasons have been arranged in the order, the derivation of which has been previously explained, which is at least a close approximation to an omniscient rating. Vertically are shown the rankings given, by the group, to each reason. Since this particular Grade VI and Grade VII, as will be shown later by reference to correlation data, have approximately the same power of arranging the reasons in true order, I have compounded the results Table IV for these two groups, comparing these with the ratings given by Grade VIII, Table V.

TABLE IV

Value of going to high school  
Grades VI and VII combined

Rankings		Reasons arranged in approximately correct order							
		G	E	D	A	H	C	F	B
	1	25	11	3	12	4	3	4	2
	2	14	22	12	6	2	3	1	4
	3	13	9	14	11	4	5	4	4
	4	3	11	12	10	8	10	3	7
	5	3	8	7	9	13	11	7	6
	6	1	1	6	7	13	16	5	15
	7	4	1	5	6	13	13	15	7
	8	1	1	5	3	7	3	25	19
		TABLE V Grade VIII							
		G	E	D	A	H	C	F	B
	1	22	2	7	1				
	2	5	8	10	6	1	2		
	3	3	12	7	4	3	3		
	4	2	8	2	13	3	3	1	
	5	..	1	1	7	14	4	4	1
	6	..	1	5	1	4	13	1	7
	7	..	..	..	..	7	6	11	8
	8	..	..	..	..	..	1	15	16

TABLE VI  
 Rankings by Grade VI and VII combined  
*Reasons for saving*

Rankings	Reasons arranged in approximately correct order											
	D	H	J	I	A	C	L	E	B	F	G	K
	1	18	5	1	3	7	19	1	1	4	3	1
	2	14	11	7	1	5	13	1	4	2	3	..
	3	7	15	8	7	5	8	1	4	2	5	..
	4	6	10	5	18	8	4	2	1	1	5	2
	5	7	8	13	9	6	2	2	4	3	6	1
	6	5	1	7	10	7	4	6	7	3	9	3
	7	3	..	11	3	8	5	6	10	5	3	4
	8	2	5	3	2	2	4	15	5	9	8	3
	9	..	4	4	4	..	1	5	8	13	5	9
	10	1	2	1	2	4	1	7	11	7	6	14
	11	..	2	1	2	7	1	9	7	9	6	9
	12	..	..	2	2	4	1	8	1	5	4	17

TABLE VII  
 Rankings by Grade VIII  
*Reasons for saving*

Reasons arranged in approximately correct order												
	D	H	J	I	A	C	L	E	B	F	G	K
1	10	6	..	2	1	6	..	2	..	3		
2	5	10	3	3	2	3	..	1	..	3		
3	3	6	8	3	1	5	1	..	1	2		
4	4	4	2	8	4	4	..	1	..	3		
5	3	1	5	5	8	1	..	4	1	..	1	1
6	1	..	6	4	6	6	3	1	2	..	1	
7	3	2	2	1	3	3	3	6	3	2	..	2
8	..	1	..	2	..	1	7	2	4	8	4	1
9	1	..	..	..	1	..	1	6	12	2	1	6
10	..	..	2	..	1	..	8	4	3	4	3	5
11	..	..	2	1	2	..	6	1	2	2	4	10
12	..	..	..	1	1	1	1	2	2	1	16	5

It will be seen, from what constitutes a scatter diagram, the extreme variability of Grades VI and VII, the results of which have been combined. Any reason, good or bad, was placed, by some member of the group, in any possible ranking. (See reasons D, H, C, B.) Seeing that this topic gave the highest correlation, for Grades VI and VII, of all the topics, the only other diagrams Table VI and VII which will be shown are those for the series entitled "Reasons for Savings." The Grade VIII diagrams for both still reveal considerable variability of judgment, but the amount of variability is much reduced.

The first coefficient of correlation ( $p$ ) has been calculated for each pupil for each topic by the square difference rank method, the squared difference method being selected because of the small penalty attached to a wrong placement of one position and the correspondingly large penalty inflicted for greater displacements. All the values have been kept in terms of ( $p$ ). These are shown in Table VIII, for the three topics.

TABLE VIII  
Table showing distribution of correlations for each grade

Value of	Value of high school			Reading of good literature			Saving		
	VI	VII	VIII	VI	VII	VIII	VI	VII	VIII
.95	4	1	10	....	1	3	....	1	3
.85	3	4	6	1	....	6	3	6	7
.75	4	4	8	....	....	5	3	8	9
.65	4	7	5	2	....	1	3	5	4
.55	3	3	2	2	4	1	10	2	4
.45	2	2	....	1	2	3	....	3	1
.35	2	3	1	3	5	1	3	1	
.25	5	1	....	5	2	2	3	1	1
.15	....	2	....	4	6	5	3		
+.05	3	1	....	6	5	2	1	3	1
-.05	....	....	....	1	2	1	....	2	
-.15	1	2	....	2	2	....	1	....	2
-.25	....	2	....	2	1	....	1		
-.35	....	....	....	....	1	2			
-.45	....	....	....	2					
-.55									
-.65				1					
Av.	.53	.48	.74	.14	.21	.48	.46	.57	.63



An examination of Table (VIII) reveals the extraordinarily small power of arranging samples, possessed by a considerable number of the pupils. Thus out of a total number of one hundred and ninety-nine ratings made by Grade VI and VII pupils, forty-four, or twenty-two per cent were so poor that they could have been equalled or exceeded by random drawing. Even with Grade VIII pupils, out of ninety-eight ratings made, eight per cent were so poor as to be capable of production by blind drawing.

In the following average Table IX I have combined the results of two further topics, taken from the unpublished work of one of my students, Mr. A. W. Brown. His data were furnished by one hundred and twenty-two pupils, approximately equally distributed over the three grades, the groups being different from those used on the first three topics.

TABLE IX

Topic	Average value of correlation for grades			
	VI	VII	VIII	Graduate students
High school.....	.53	.48	.73	.96
Good literature.....	.14	.21	.48	.95
Savings.....	.46	.57	.63	.94
Sports.....	.31	.25	.51	.92
School until 14 yrs.....	.31	.32	.52	.91
Averages.....	.35	.37	.58	.94

#### INTERPRETATION OF RESULTS

While little reliability can be attached to any single figure, yet certain conclusions based on large averages may be drawn without undue forcing. We may say that for such passages as have been chosen:

1. Grade VI and Grade VII, on an average, fail to exhibit an ability which enables them to rank reasons with a sufficient degree of accuracy to yield an average correlation of .36.

2. Grade VIII is distinctly better than Grades VI or VII, though even in Grade VIII the correlation is only .58.

3. What may be accepted as a standard correlation, at least as good a correlation as can be obtained from any group, can be taken as .94, the average afforded by a small group of graduate students.

4. Whether the extremely rapid rise between Grade VII and VIII will be substantiated by further experimentation is at least open to doubt. If the result is taken at its face value, it can easily be explained on the assumption that it is not until Grade VIII is reached that the pupils, as a group, have the necessary contributing factors to form even a fairly reliable judgment of this degree of complexity. Among these contributing factors are

1. the necessary background of experience,
2. the easy understanding of what is read,
3. the habit of suspending judgment,
4. the habit of taking pains, if such generalized habits may be supposed to exist.

The general conclusions of the paper are of course absolutely dependent upon the manner in which the reader interprets what is the success attending a group, for which the average correlation, under the conditions of the experiment, is .36. Certainly an examination of the sample scatter diagrams should make evident how difficult it must be to obtain anything approaching sound group judgment, involving complex subject matter, from a class of Grade VI or Grade VII pupils. The teacher in these grades, finding the judgments so erratic, and having a somewhat heavy curriculum, resorts to the natural alternative, namely, dogmatic statements.

If the reader believes that this low correlation is due largely to lack of training, he will merely quote this study as further evidence of the evil results of dogmatic method of teaching. Certainly under present-day school conditions, children are given little opportunity to have their judgments checked up and talked over by those in authority. In many cases they are not even allowed to have their own opinions.

In contradistinction to this interpretation, if the reader inclines to the belief that judgments of this type depend upon a hierarchy of habits, and a breadth of experience, which for obvious reasons are somewhat late in appearance, then there is perhaps in those subjects involving complex factors some justification for the present dogmatic methods of teaching in the grades. At the present moment, the author has no quantitative evidence to offer, which would help to decide this crucial question.

My thanks are due to Mr. C. L. Kirschner of the New Haven High School and Mr. W. H. Martin of the Scranton School for the facilities afforded me in their schools.

# FURTHER DATA ON THE BELL CHEMISTRY TEST

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A recent article by Professor Thomas H. Briggs<sup>1</sup> of Columbia, suggesting that the original standards set by the author of the Bell Chemistry Test<sup>2</sup> may be too low, has stimulated the writer of this paper to offer the results of his use of the Bell Test in support of the position of Doctor Briggs. The basis of this report is in records made by two groups of pupils; one in the Biddeford (Maine) High School and one at Worcester Academy. Group I was a class of twenty-two high school Juniors, fourteen boys and eight girls, who were tested near the completion of nine months of study of chemistry. Group II

TABLE I  
Scores in Bell chemistry test

Score	Number of pupils	
	Group I Nine months of training under a teacher with one year's experience	Group II After six months of study
below 50	3	1
50-54	0	3
55-59	4	3
60-64	3	1
65-69	2	4
70-74	3	0
75-79	5	6
80-84	1	4
85-89	0	1
90 and above	1	2
Total.....	22	25
Median.....	68	75
Average.....	65.7	70.1

<sup>1</sup> *Journal of Educational Psychology*, 11: 224-8.

<sup>2</sup> *Id.* 9: 199-209. *School of Science and Mathematics*, 18: 425-32.



was a group of twenty-five boys, mostly Seniors, tested after six months of training. The first group was taught by a man with one year's experience; the second, by the writer. The distribution of scores is shown in Table I.

These two sets of papers were marked before the publication of the acceptable answers,<sup>1</sup> yet there was so close an agreement between the set used and the published set that the resulting scores are not seriously affected by the minor differences. The differences that existed were of such a nature as to reduce slightly the scores of Groups I and II below what they would have been had the published answers been available. These two groups were made up of unselected pupils from two types of New England secondary schools, subjected to the Bell Test without warning. Therefore, the results may be deserving of consideration in arriving at a final standard.

For purposes of convenient comparison, these results are shown with those of Bell and Briggs in Table II.

TABLE II  
Results of Bell chemistry test

Group	Scores	
	Median	Average
Three hundred thirty-seven pupils in fourteen Texas High Schools <sup>2</sup> .....	.....	59
Twenty-seven pupils in Reading (Pa.) Boys' High School <sup>1</sup> .....	57.25	57.96
Eleven pupils in Horace Mann School for Boys <sup>1</sup> .....	82.5	79.09
Twenty-two pupils in Biddeford (Me.) High School.....	68	65.7
Twenty-five boys in Worcester (Mass.) Academy.....	75	70.1

The relative difficulty of the twenty-five questions may be judged from Table III.

Table III is read as follows: The easiest question (*i.e.*, the one receiving a correct answer from the largest per cent of pupils) was number one (What chemicals are liberated in the electrolysis of water?) for the pupils of fourteen Texas high schools after eight months of training; number fourteen (Name the two most abundant elements in the atmosphere) for the Biddeford High School Juniors after nine months of study; and number one for the Worcester Academy Seniors who had studied Chemistry six months. The next to the easiest

TABLE III

Relative difficulty of questions in Bell chemistry test as judged from the per cent of students giving correct answers.

Position of the question	Number of the question		
	Fourteen Texas schools after 8 months of study <sup>3</sup>	Group I. Biddeford H. S. Juniors after 9 months study	Group II. Worcester Academy boys after 6 months study
1 easiest	1	14	1
2	2	2	4
3	24		
4		4-19-24	5-23
	5-19		
5			24
6	14	1	16
7	10	11	
			14-22
8	23	8	
9	13		
		6-22	8-19
10	16		
11	22	9	6-13
12	6		
		5-7	
13		....	3
	3-18		
14		10	
			10-25
15	7	3	
16		25	12
	4-8		
17			17-20
18	11	18-20-23	
19			11
	9-12		
20		16	7
21	17	21	2
22	20	15	9
23	25	13	21
24	21	17	15
25 most difficult	15	12	18

3. From tables I and III, *Journal of Educational Psychology*, 9: 199-209.

question was number two (What gas is given off by the action of yeast in bread dough?) for the two high school groups and number four (Express in cubic centimeters one liter) for the Worcester Academy boys, etc.

In this table it will be noted that of the easiest seven questions for the Texas group, five were among the easiest seven for Group I;

and four, for Group II. Of the most difficult seven questions for the Texas group five are found among the most difficult seven for Group I and only three for Group II. The correlations in these three cases, calculated according to the Pearson method are found in Table IV.

TABLE IV

Grade-position correlations for the twenty-five questions of the Bell chemistry test.

Groups correlated	<i>r</i>
Texas group—Group I.....	.63
Texas group—Group II.....	.61
Group I—Group II.....	.42
Average.....	.55



# TRAINING IN PERCEPTION AS A MEANS OF ACCELERATING THE SILENT READING RATE<sup>1</sup>

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The core of the reading complex is the process of perception. The movement of the eyes from pause to pause, their convergence and divergence in fixation, the numerous and varied play of the neural-muscular mechanism involved in the ocular adjustment to the printed symbols, are all subsidiary to the main process of perception. The latter constitutes the actual seeing or visualization of the printed words. The results of numerous investigations, as stated in the earlier chapters, have shown that the overwhelming bulk of the reading time, in fact from  $12\frac{1}{13}$  to  $23\frac{3}{4}$ , is consumed by the fixation pauses. The total reading time, therefore, may be said to be practically the number of the pauses multiplied by their average duration. But the number of pauses per line is dependent upon the size of the perceptual span—the wider the span the fewer the pauses, and *vice versa*. Hence a type of training that is to effect any appreciable economy in the reading time must in some way or other influence the perceptual process that occurs in the fixation pause. The improvement may be secured either by widening the visual span, causing fewer fixations, or by accelerating the perceptual process thus lessening the duration of the fixation pauses, or by a combination of both these results.

## PERIPHERAL VISION

Upon the fixation pause, during which all vision or perception occurs, has been focused the attention of many investigators. The perception that occurs therein is of two kinds, foveal and peripheral. The area that can be grasped by foveal vision in any one fixation is relatively small. Only about five letters (1)<sup>2</sup> will be “unequivocally clear” when the eyes are held quite stationary. The adjoining letters will not be so sharply defined, but will shade off gradually into a hazy outline growing fainter and fainter as they recede from the foveal area. These letters are grasped only by peripheral vision. The area of

<sup>1</sup> A chapter from the book, “Silent Reading,” which has just been published by The Macmillan Co.

<sup>2</sup> Numbers in parentheses refer to corresponding numbers in the end of this article.

peripheral vision is consequently much larger than that of clear vision. The number and duration of pauses per line and the speed of reading in general are thus seen to be conditioned to a considerable degree by the effective utilization of extra-foveal vision. The importance of this phase of the reading-complex seems to have been rather generally overlooked. Practically no conscious attempt is made in the present teaching of reading in the schools to develop peripheral vision or to enlarge its area. Reading which is wholly or chiefly dependent upon foveal vision will be slow and halting, marred by too frequent pauses which inhibit the development of a regular rhythmical swing of the eyes in traversing the printed line.

Dodge (1) who has analyzed the functioning of the various elements in the reading complex with marked acuteness, thus describes the work of extra-foveal vision:

"Sometimes the peripheral vision of words when they are indistinctly seen in the hazy part of a line, is sufficient for reading. It is always useful furnishing an important premonition of coming words and phrases, as well as a consciousness of the relation of the immediately fixated symbols to the larger groups of phrase and sentence. Without this premonition of coming words and the outlines of larger groups, the process of reading would be slow and difficult."

"In normal reading . . . there is abundant evidence that the word forms, indistinctly seen in peripheral vision begin the reading process well in advance of direct fixation and the consequent clearing up of the letters.

It is this premonition of coming words and phrases, sentence breaks, and paragraphs, that determines the position of future fixations, and reduces the duration of individual fixations sometimes to pauses one-quarter the normal perception time. They are often less than the simple reaction of the eye."

Not only is peripheral vision effective in decreasing the number and duration of the fixation pauses per line and consequently accelerating the rate; but it is also instrumental in fostering and stimulating meaning premonitions, thereby improving comprehension as well. Hand in hand with reaching out of perception beyond the immediate field of clear vision seems to go the reaching ahead of the assimilative factor beyond the meaning grasped in direct fixation to those dimly felt in the extra-foveal area. Meaning premonitions made more numerous and more vigorous by the functioning of a wide peripheral vision, play an important rôle in the rapid interpretation of the printed



page. Just as extra-foveal vision frequently suffices for the reading of a word without the agency of direct fixation, so meaning premonitions not infrequently carry the reader over many a word without the immediate apprehension of the word in direct fixation. This is evidenced by the fact that a person in reading a selection aloud in which the meaning premonitions stream thick and fast in his consciousness will unwittingly substitute a synonym for the word actually occurring in the passage.

Concerning the importance of these meaning premonitions, Dodge (1) says: "Adequate premonitions are as conspicuously lacking in the stumbling reading of childhood as in our reading of a foreign language. Their development is a most important part of the training in rapid reading. The very rapid reader who makes two or three steps in a line can see no more distinctly than the plodder with ten. *His main advantage is in the way he grasps what he sees only indistinctly in the extra-fixational vision.*" (Italics are inserted.)

The type of Training which will be outlined in this article has aimed to develop the more generous utilization of peripheral vision, and of its mental correlate—meaning premonitions. The direction to the pupils in the exposure exercises, requesting them to read the sentence "as a whole" allowing time sufficient for but a single fixation was calculated to call the peripheral vision into play, while the suggestion to occasionally look up and tell "how much they saw ahead" and how much of the remaining meaning of the sentence they could give, was designed to develop meaning premonitions along with the extra-foveal vision.

#### FOVEAL VISION

However important a factor peripheral vision may be in developing rapid, effective reading, direct or foveal vision still constitutes the core of the perceptual process—perception *per se*. In the field of clear vision it is not a matter of conjectural interpretation or inferences from previously perceived premises, but a matter of direct fixation and immediate apprehension. The functioning of direct fixation in connection with extra-foveal vision, Dodge (1) thus describes: "In adult reading the moment of actual fixation seems to be an incident somewhere in the middle of the reading process. Coming between the premonition and the after echo, its effect is to correct, confirm, and to intensify the premonition. Psychologically, its function is selective and definitive. It emphasizes the excitation of suitable residua and



inhibits the misfits. The pedagogical importance of word forms is clear. It is possible that special training in peripheral vision would be worth while, but it is equally evident that no training is adequate which does not provide for the corrective cooperation of direct fixation.

The Type of Training to be outlined in this article, aims definitely at the enlarging of the perceptual span functioning in reading. The work in exposure exercises attacks this problem directly. It endeavors to widen the span of attention so as to grasp, three, four, five, six, and even more words if possible in a single fixation. C. T. Gray (2) showed that a marked increase in the visual span resulted in the case of two fourth-grade subjects after training in perception by means of tachistoscopic exposures. In the case of the two sixth-grade subjects, however, similar short exposure exercises did not seem to effect any appreciable widening of the perceptual span *as determined by the number of words grasped in a tachistoscopic exposure*. However, an examination of the data afforded by the photographic record of the eye movements in the reading of one of the two subjects, B.R., taken before and after the training in perception yields a rather striking result. The following is a statement of the record as reported by Gray (2).

TABLE I  
Eye-movement record of B. R. before and after practice

	Average No. of pauses	Average length of pauses	Average No. of regressive movements
Before practice.....	15.5	15.4	4.5
After practice.....	6.1	12.6	1.2
After 3 months interval.....	8.4	....	1.2

An examination of these records clearly demonstrates a striking enlargement of the perceptual span *which functions in actual reading*. This is evidenced by the reduction in the average number of pauses per line from 15.5 in the first reading to 6.1 in the reading after the practice in perception. This indicates that the size of the perceptual span was more than doubled since its width bears an *inverse* proportion to the number of fixation-pauses per line. Even the average duration of the perceptual process in the fixation-pauses was decreased from 15.4 to 12.6 showing improvement in this phase of the process also. A notable decrease in the average number of regressive movements per line is

likewise noticeable. B. R.'s rate of reading as determined by careful tests had increased from 1.0 word per second before the practice to 5.0 words per second after the training—an improvement of 400 per cent.

Consequently while B. R.'s span of attention showed no notable increase in grasping numbers of words exposed by a tachistoscope, it showed a striking enlargement in reading an actual context. In alluding to this point in Chapter III, the writer termed the latter the *relative span of attention*, the span which functions in reading a context material, in contradistinction to the *absolute span* which functions in tachistoscopic exposure work. Exercises of this latter character have shown that the perceptual span which they call into play, grasping, as it does, five and six words in a single fixation, is seldom fully utilized in ordinary reading where the span rarely exceeds two or three words. Consequently, while the absolute span of perception may show no increase as a result of training in perception, the relative span which functions in ordinary reading may reveal a striking increase as in the present instance. In other words, the perceptual span is *utilized more effectively* in reading. The point made here is that this is true not only of fourth-grade subjects, but also of older subjects as B. R.'s case well illustrates. The eye-movement records of B. R. certainly lend no support to the tentative conclusion of Gray that training in perception, if it is to produce results, should come before the fourth-grade. For, the perceptual span as it functions, not in the grasping of isolated words or phrases, but as it is used in the reading of connected material is the important factor. That this latter is susceptible to improvement has been clearly shown by the record of Gray's subject, B. R.

#### RELATION OF SPEED OF READING TO TYPES OF IMAGERY

What is the effect of the different types of mental imagery upon the rate of reading? In other words, is the reading rate largely conditioned by the mode of imaging? If so, what types are conducive to rapidity and what ones tend to retard? These are some of the interesting questions which have been touched upon in recent studies in the psychology of reading.

To the above queries W. A. Schmidt (3) gives no uncertain answer:

"Individuals of this (visual) type" says he, "are by nature rapid readers, other conditions being equal. Their speed is not due to scanning, however, for they have no occasion to resort to this, since there is almost no limit to the rate of visualization. The motor type, on the other hand, tends to represent the slowest readers, the dependence



upon the physiological mechanism being in this case quite marked. The auditory type ranks between the two, the hearing of the words being in this case often quite vestigial. This type appears to be much more common than either of the other two types. Most of the evidence which the writer has been able to gather through interviews with a large number of individuals seems to support the conclusion that the auditory-motor type of reader can compete with the visual only when he is able to resort to scanning. There can be little doubt that rapid readers fall almost exclusively into these two classes—those on the one hand who are good visualizers and those on the other hand who have acquired the ability to gather meaning from the printed page without definitely reading all the words and sentences."

The above conclusion of Schmidt's appears to the writer to possess a certain amount of plausibility. It seems at least *a priori* logical to assume that reading which involves merely, or at least chiefly, visualization, requires less functioning of the physiological mechanism than the auditory or motor type with their more or less elaborate movement of the musculature of articulation. Involving a less elaborate functioning, visualization would seem to be a more direct and more rapid mode of reading. Schmidt appears to go rather far, however, in maintaining that "good readers fall almost exclusively into two classes"—good visualizers and those able to scan; that the auditory or motor readers can compete with visualizers only when they resort to scanning.

In the first place, the data which throw any light upon the influence of the various types of imagery upon the reading rate are exceedingly meagre. The scanty evidence that is available, however, does not seem to warrant so positive a statement as to the conditioning, determining influence of the mode of imaging upon reading rate. There are numerous instances in the literature of very rapid readers who are decidedly "auditaires" and "motaires" but who can compete very successfully with the visuals. Moreover, it is to be remembered that the audition may be of the faint, vestigial, psychical character involving according to the introspection of some psychologists, no movement whatsoever of the musculature of articulation. In the writer's judgment it is in the latter factor—the elaborate functioning of the physiological mechanism of vocalization—that the retarding influence is largely to be located. If the latter be eliminated a high rate of speed may be reached regardless of the type of imagery, as the results of the present investigation indicate.



"Most of the evidence which the writer has been able to gather through interviews" is mentioned by Schmidt as the data<sup>1</sup> from which he generalizes concerning the conditioning influence of the various types of imagery upon the reading rate. A grave difficulty which confronted the writer in his endeavor to secure data on this point by questioning readers as to their mode of imaging and their reading rate, was their inability in the overwhelming majority of cases to determine with anything approaching certainty what is their dominant type of imagery. Nor is that strange. For, practically all the recent investigations (4-9) of imagery types have shown that as a general rule individuals employ not a single constant type but many types of imagery. Netschajeff (10) has conclusively demonstrated the existence of such combinations of imagery types for example, as the visual-motor, the auditory-motor, the auditory-visual motor, etc. Indeed, even in a single type of mental work, individuals are found using now one, now another mode of imaging. There is a confusing complexity of modes of imaging in a single individual.

In view of this fact it is not surprising that an individual when interviewed can scarcely state off-hand what is his precise type of imagery. Even when subjected to psychological tests in the laboratory, the dominant type of imagery is not always established with certainty. Indeed there is no single, psychological test, that can be relied upon to discover with certainty the dominant mode of imaging in the case of a "mixed" type. It is in the latter case, moreover, that most individuals are found to belong. Meumann (11) epitomizes the result of his own extensive investigations and those of other investigators when he states: "Investigation has shown, however, the the great majority of people belong not to pure, but to mixed or balanced ideational types. In there cases, we have a compromise

<sup>1</sup> After the above had been written, the writer received a communication from Dr. Schmidt, in which the latter mentions Quantz's experiment as corroborative of his generalization. As the writer had already analyzed the results of Quantz's experiment in this article, it is felt that all of the essential data upon which Dr. Schmidt's conclusion rests, have been considered. Dr. Schmidt also states that the adults whom he interviewed "were, for the most part, individuals who had studied psychology rather extensively. In consequence they were, as a rule, able to attempt (whether they succeeded is quite another question) to classify themselves as auditory, motor, or visual in type." In the writer's judgment, the attempt to classify oneself in regard to imagery type, without using any psychological test, is rather precarious. Dr. Schmidt has the gratitude of the writer for his additional information.

between ideational type and sense-modality." Illustrating the complexity of modes of imaging in a single individual, he says: "For instance, the concrete visual type of ideation may co-exist in any individual with verbal ideation of another source,—with vocal-motor or with verbal auditory imagery."

Consequently the question might well be raised as to the accuracy and the general value to be attached to information derived from interviews upon a question that is notoriously difficult to answer, even when fortified with the results of a psychological test, let alone when answered off-hand without such a basis for a reply.

The only express attempt, to the writer's knowledge, to attack the problem of the influence of imagery types upon reading rate was the experiment of Quantz (12) at Wisconsin. Quantz sought to determine the relative influence of the visual and the aural bias upon the reading rate in three ways: "(1) by testing the visual and auditory span; that is, the limit of power to repeat correctly words read or heard once; (2) by detection of differences between two variant readings of the same passage; (3) by the ability to reproduce the thoughts of two selections, one of which was read to the subject, the other read silently by him, *at the same time.*"

Whether any of these three tests actually determined the dominant type, or even the relative strength of the visual and auditory imagery in the individual, is very doubtful. Underlying the three methods employed by Quantz is the assumption that the capacity to grasp and remember or reproduce words presented orally, or visually constitutes an index of the relative strength of the auditory or visual type of imagery. That words presented orally and reproduced in the same manner do not necessarily tap solely the auditory type of imagery is evident from the fact that there is always the possibility of transforming the auditory impression into another more favored type of imagery. The same is true of the possibility of transforming the visual impression into an auditory image. The existence of such a substitute mode of imaging, a "surrogate," or sort of vicarious functioning of imagery types, which has been experimentally demonstrated by Meumann serves to render the fundamental assumption underlying Quantz's three tests very doubtful and the conclusions based upon such tests, of similar questionable validity.

Indeed Meumann (11) cites as an illustration of a process wherein substitute imagery may be employed, practically the same task as



Quantz's test of the span of prehension—"the limit of power to repeat correctly words read or heard once." "Let us take," says Meumann, "the case of an individual who has read a list of words or to whom such a list has been dictated, with a view to having them reproduced immediately in vocal form. The mixed type is always able to adapt itself to this task. . . . In recalling auditory words immediately after hearing them, the visualizer may employ auditory images chiefly, but may make a secondary use of the visual imagery into which he has transformed the auditory material; but in recalling a conversation with a friend after a long interval, . . . he has recourse chiefly to visual images of expressions employed by his friend during the conversation. The individual who belongs to a pure type, on the other hand, endeavors in immediate retention to transform into his own favored imagery the sensory impressions which he receives."

The results obtained from the three tests applied by Quantz are by no means uniform. The evidence from the first test (span of prehension) Quantz construes to indicate "a gradual increase in the rate of reading as the subject moves away from the auditory type and toward the visual." The results of the second test (detection of differences) are just the reverse, showing that the auditory type is decidedly more conducive to rapidity in reading than the visual type; while the third test (comparison by simultaneous processes) seems to show a correlation between eye-mindedness and rapid reading. The conflicting character of the results obtained tends strongly to corroborate the writer's conclusion that not one of Quantz's three tests are really capable of determining whether the subject was dominantly of the visual or of the auditory type. Not having determined that first essential fact for a comparison of the relative advantage of the visual or auditory bias upon the reading rate, conclusions based upon correlations of reading rate with prehension span or similar exercises are quite lacking in validity. But even if it were assumed that the imagery types were established with precision, a conclusion as to the decided advantage of the visual over the auditory would scarcely be warranted in view of the conflicting character of the results obtained.

Thus the results—meagre and conflicting as they are—of the only direct experimental investigation of this problem would hardly seem to support so positive a conclusion as Schmidt's that "the auditory-motor type of reader can compete with the visual only when he is able to resort to scanning."



Meumann does not treat specifically of the effect of the imagery types upon rate of reading, but he does discuss their influence upon rate of associative learning. In this connection, he states that "the auditory-motor individual always seems to possess a less reliable, but a *more rapid* memory " than the individual of the visual type. The auditory-motor type seems to function more rapidly in associative learning.

To the question then, is the visual or the auditory bias more conducive to rapidity in reading, no positive definite answer, in the writer's judgement, can as yet be given. The paucity of experimental evidence on this point is such as to render any conclusion but tentative and highly conjectural. The conclusion of Schmidt's ranking the visual type as the most advantageous, the motor type the least, and the auditory as intermediate, while theoretically very plausible, is, as yet, without sufficient experimental corroboration. But the meagre evidence that does exist warrants no such fatalistic attitude as Schmidt's concerning the all-powerful, conditioning influence of the imagery type upon reading rate. Rapid readers have been found among all types of imagery. In the present study the vast increase in speed reported of all the experimental pupils in certain grades, —in which there were beyond doubt different types of imagery—indicates that marked improvement in rate may be secured regardless of the pupil's mode of imaging.

#### TRAINING IN PERCEPTION

The third type of training has been based directly upon the findings of the psychological laboratory as to the functioning of the eyes during reading, showing the crucial importance of developing and widening the perceptual span, or at least of making more effective use of it in reading, of decreasing the duration of the fixation pauses, and cultivating a regular rhythmical swing of the eyes in the interfixation movements. The method was worked out carefully in its entirety. It was found, however, that none of the present types of tachistoscope could be used satisfactorily for groups of pupils. In class exercises the word or phrase exposed should be legible equally, (or approximately so) to every pupil. An apparatus which would expose cards containing words and phrases of varying length suitable to a whole class, for intervals ranging from about  $\frac{1}{12}$  of a second to two seconds, and which would, moreover, be easily manipulated by the teacher

was found necessary if the work was to be done with the scientific accuracy necessary for the purposes of this experiment.

Such an instrument could not be devised in the time at the writer's disposal before the launching of the experiment on the scheduled date. C. H. Stoelting of Chicago with whom the plans were carefully discussed, has given the writer the assurance that an instrument of this type suitable for class-room purposes can be devised. Superintendent Taylor of Oregon has also worked out plans for its construction. The proper instrument may be available shortly. Though this type of training was not actually applied in the present investigation because of the lack of proper technical apparatus, it is thought that the presentation of an outline of the method may be worth while. This would seem to be so in view of the probable appearance of the necessary mechanical device in the near future and because there is considerable evidence which points to a method of this kind as capable of greatly accelerating the reading rate. It is the hope of the promoters of this experiment to submit this type of training to an actual test when the necessary mechanical facilities are at hand.

#### TRAINING IN RAPIDITY OF READING BY MEANS OF PERCEPTION CARDS

References: Types of Reading Ability as Exhibited Through Tests and Laboratory Experiments, C. T. Gray, Supplementary Monographs, Vol. I, No. 5, University of Chicago Press, pages 149ff and 157ff.

The purpose of this investigation is to determine the extent to which speed in silent reading can be increased by training pupils in rapid reading through the use of perception cards. The practical value of a type of training which will accelerate the rate of silent reading is obvious. Your cooperation in this study will aid in definitely ascertaining means of accomplishing this end. The results of this investigation will be sent to every teacher participating in the work.

The cards used should be four inches wide and of varying lengths to contain words, phrases, or sentences.

The use of these cards is analogous to that of the exposure of material in laboratory work by means of an exposure apparatus or tachistoscope. In both cases, the subject is required to perceive the material exposed in as short a time as possible. There is experimental

evidence tending to show that the amount of verbal material which a person can perceive in a given time can be increased—in other words, that perception may be improved. Probably it is not true that perception as a native endowment may be improved, but the method of using the native endowment—*i.e.* the performance—is susceptible of extensive improvement.

The rate at which children can perceive words, phrases, and sentences has a rather obvious bearing on their speed of reading. Reading consists of a successive series of perceptions. The eye does not move regularly along the printed line but jumps from one point to another, pausing at each point. It is during the pause that perception takes place. In a very real sense, therefore, the printed line consists of a series of flashes or exposures.

To improve the rate of reading, we need to reduce the number of exposures per line by increasing the amount of material presented at each exposure and to shorten the length of each exposure. This suggests that we may directly attack the problem of increasing the speed of reading (*a*) by training the pupil to “see more at a glance,” and (*b*) by training him to see the material more quickly.

Obviously we cannot control either the amount seen at a glance or the time of the exposure by using the printed page. If, however, we can present, by means of perception cards, portions of the text in the form of words, phrases, and sentences, we may gradually lengthen the amount of material on the cards as the pupil's ability to perceive it increases, and we may also reduce the time during which it is placed in view.

This is the fundamental idea in the method we are now proposing.

The reading period should be 30 minutes long. Half the period should be devoted to the presentation of material by means of the perception cards. The remainder of the period should be devoted to reading from the book in which, as far as possible, the same words, phrases and sentences are met.

During the first half of the period the attempt should always be to make the period of exposure of the cards as short as possible. Day by day the length of the material should be increased. In fact, either one of two methods may be used and both should be used during the course of the experiment: (*a*) the time of exposure may be kept constant and the length of the material may be increased; (*b*) the length of the material may be kept constant and the time decreased.

In order to obviate as far as possible any interference with the



perceptive processes due to the presence of unfamiliar words, the teacher should drill on single words which she has reason to believe are unknown to a number of the children. These words may be placed on the board or presented in the usual manner.

It is desirable that the material be printed on the perception cards rather than written. For this purpose a stamping outfit should be provided. It is recognized also that a great deal of work will be involved in preparation for the class period. The promoters of the experiment are willing to cooperate with the teachers in securing help for this work.

The second part of the period should be devoted to a conscious attempt on the part of the teacher to secure a transfer of the perception processes from the cards to the printed page. When a phrase or sentence is encountered, children should be told that the phrase or sentence is to be "seen altogether." Such directions as "do not look at every word," "see it as a whole," "read it altogether" and the like, may serve to carry over from the work with the cards to the work in the book something of the same attitude.

This method should continue for two months. An accurate record of the progress of the pupils should be kept so that the increase in perceptual span and in rapidity of perception may be noted. A simple form will be provided for this purpose. The teacher is also requested to keep a diary in which she will daily record notes and observations concerning the progress of the experiment.

The teacher should select easy reading material for use during this experiment in order that the difficulty due to unfamiliar words may be reduced. In all the reading other than that done in the half hours set aside for the experiment, the teacher should seek by admonition, encouragement and example to inculcate the idea of increasing the span of perception—*e.g.* reading by phrases—and to decrease the time required to "look at" a group of words. An interesting exercise may be devised in which pupils may be requested to glance at the first words of a paragraph and immediately raise their eyes, whereupon they may tell "how much they saw."

The following suggestions are offered indicating the nature of the directions to be given to the pupils. Literal adherence to them is not requested. Point out the advantage of a rapid rate of reading. Try to get them to see this in terms of an addition to their own interests and pleasure. Say to them in substance: "I shall show you some cards containing words, phrases and sentences. They will be shown

for only a fraction of a second. So you will have to read them very quickly, with a single glance of the eyes. Try to read all that is printed on each card. You will have to pay very close attention when I show you the card, as otherwise you will not be able to read all that is on the card. This practice in reading a number of words at a glance will help you to read more rapidly. Try to do better than you did yesterday."

Spend about 15 minutes in perception card training. After each exposure ask some of the pupils to tell what was printed on the card. Toward the end of the training in perception, have all the pupils reproduce in writing what was on each of the five last cards exposed. The percentage of words correctly reproduced will constitute the pupils score in perception. State the total number of words exposed on the five cards and it will then be easy for each pupil to figure out his own score. Direct each pupil to enter his score immediately upon the chart that each pupil will keep for that purpose.

The second half of the period should now be devoted to rapid silent reading. The pupils should be encouraged to carry over the habit of "seeing many words at a glance," gained by their training in perception, into the actual work of silent reading. They should be directed to "run their eye across a line of words" as rapidly as they can, consistently of course, with an understanding of what they see. Throughout this reading period there should be a conscious effort to utilize the habit acquired through training in perception, by perceiving several words at each fixation, instead of but a single word. This should result in an increased rate of speed in silent reading.

Say to the pupils in substance: "Read this selection as fast as you<sup>1</sup> can. I want to see how much you can read in ——— minutes. Try to see as much as you can read in a single glance, running your eyes rapidly across the lines. A fast, regular, rhythmical movement of the eyes will help you to read rapidly. But remember that I am going to ask you to tell me about the matter you have read so do not skip anything. Try to read faster today than you did yesterday.

See that the pupils have a pencil at hand and direct them to stop reading at once as soon as you say "stop." Direct them then to mark the end the line which they are reading when told to stop. Pupils may now reproduce what they have read. Reproduction should consist both of free paraphrase—orally, or in writing—and of answers to specific questions based on the test. The length of the reading period and

<sup>1</sup> Number of minutes, say 2, 3 or 4, to be determined by the teacher.



of the reproduction period should vary with the grade of the pupils and with the subject matter. In general, however, the reproduction should not occupy more than one quarter of the total time allowed for the exercise. Reading and reproduction are to be continued till the end of the 15 minutes assigned. Have the pupils then report the number of pages and lines beyond the last full page which they read.

As part of your preparation for the exercise you will be expected to know the average number of words per line in the matter which is being read and the number of lines per page (if pages are broken by illustrations or for other reasons, special account of these pages will have to be taken). From the pupils' reports as to pages and lines read on this subsequent assignments for the day, estimate the number of words read that day and divide by the total number of minutes used in reading. This will give the number of words read per minute by each pupil. Each student should figure out his own score, and should enter it immediately on the chart on which he has already written his perception score. This chart will thus serve as a record of the pupil's daily progress. It is also suggested that a complete chart of the daily class performance might be conspicuously displayed in the class-room.

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# A COMPARISON OF RESULTS OBTAINED BY THE TERMAN BINET TESTS AND THE HEALY PICTURE COMPLETION TEST

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The following study was made to determine, if possible, to what extent the Terman Binet and Healy Picture Completion Tests give identical results. In case they do not give identical results we are put frankly face to face with a number of facts which cannot be overlooked in mental testing work and particularly in our concept of "general intelligence."

The report is based upon 65 cases, the great majority of which are below the Normal or average in the mental age by the Terman Binet scale. The writer wishes to acknowledge his obligation to Professor Jackson, of the Department of Education, University of Michigan, who kindly loaned the Binet ratings of 26 of the cases. The writer was thus saved the trouble and time of testing these 26 cases by the Binet Scale, merely having to give the Healy tests personally. (The difference in elapsed time was, of, course, provided for.) The other 39 cases were selected from the writer's personal record book.

Twenty six of the children tested were in the ungraded class in the Ann Arbor, Mich. Perry School. The rest of the children were cases tested by the writer in his work as mental tester for the Social Service Dept., University Homeopathic Hospital, Ann Arbor. Practically all the children tested are under the chronological age of 14, most of them being grouped between the age of 8 and 14 years.

The procedure and standards laid down by Pintner and Anderson for the Picture Completion Test were followed. As the test is relatively useless for adults, no adult cases appear in this report.

Inasmuch as only a study of each individual case can really show adequately the comparisons, we have given our results in detail.

Approaching the data first from an angle of very rough comparison, we have arranged all cases under both Tests into three general groups, (1) those cases testing in mental age below their chron. age, (2) those testing at age or normal, and (3) those advanced in mental age. Using this general grouping we find that, of the 65 cases recorded:

29 or 44.44 per cent stand in the same rough classification by each test;  
19 or 29.23 per cent stand with diametrically opposed rating (e.g. Inferior-super.).

17 or 26.15 per cent stand differently classed (e.g. normal and superior).

Subject	Chron. age	Sex	Terman Binet Rating			Healy Picture Test		
			Ment. age	I.Q.	Class.	Score	Time	Class
1	10-9	M	7-4	69	F. M.	588	6' 30"	Adult
2	10-7	M	9-2	87	Dull	518	5' 00"	Adult
3	10-4	F	8-8	84	Dull	127	4' 00"	Age 7
4	10-9	F	7-6	70	Border	7	0' 00"	Age 5
5	10-0	M	7-0	70	Border	241	4' 30"	Age 8
6	5-0	F	5-5	107	Normal	3	0' 00"	Below 5
7	9-0	M	9-0	100	Normal	258	2' 00"	Age 8
8	14-4	M	11-4	80	Dull	581	7' 00"	Adult
9	14-8	M	10-10	74	Border	444	4' 34"	Age 15
10	11-5	F	7-0	62	F. M.	502	3' 05"	Adult
11	13-8	F	9-1	70	Border	222	5' 45"	Age 8
12	9-0	F	7-4	82	Dull	134	4' 45"	Age 6
13	12-6	M	9-5	76	Border	509	7' 57"	Adult
14	9-10	M	8-7	88	Dull	464	6' 20"	Adult
15	6-0	M	6-0	100	Normal	65	8' 32"	Age 6
16	7-6	F	7-6	100	Normal	204	19' 24"	Age 8
17	11-6	M	7-4	64	F. M.	421	4' 04"	Age 13
18	12-2	M	9-10	80	Dull	578	6' 33"	Adult
19	8-6	M	7-4	87	Dull	261	3' 41"	Age 8
20	8-8	M	9-0	104	Normal	483	3' 00"	Adult
21	12-9	F	9-1	70	Border	95	0' 00"	Age 6
22	11-0	M	8-6	70	Border	646	2' 05"	Adult
23	14-0	M	8-10	61	F. M.	449	3' 00"	Age 15
24	15-0	M	11-1	73	Border	417	5' 00"	Age 13
25	20-0	F	8-2	51	F. M.	326	7' 00"	Age 10
26	14-0	M	9-2	62	F. M.	566	2' 05"	Adult
27	12-0	M	6-8	52	F. M.	343	21' 00"	Age 15
28	14-0	M	8-3	57	F. M.	583	1' 05"	Adult
29	13-0	M	10-6	78	Border	380	2' 00"	Age 11
30	10-0	F	8-7	85	Dull	583	4' 00"	Adult
31	15-0	M	7-0	42	F. M.	437	2' 05"	Age 14
32	14-0	M	8-4	53	F. M.	88	2' 05"	Age 8
33	13-0	F	10-3	75	Border	646	4' 05"	Adult
34	13-0	M	8-10	66	F. M.	479	4' 05"	Adult
35	14-0	F	9-0	62	F. M.	395	4' 05"	Age 14
36	13-0	M	9-7	75	Border	502	7' 00"	Adult
37	14-0	M	11-7	82	Dull	646	4' 00"	Adult
38	15-0	M	9-1	61	F. M.	257	2' 30"	Age 8
39	13-0	M	7-8	71	Border	308	7' 30"	Age 9
40	14-10	M	8-6	57	F. M.	324	2' 55"	Age 9
41	13-11	M	6-10	50	F. M.	242	3' 32"	Age 8
42	14-8	M	8-0	56	F. M.	63	5' 20"	Age 6
43	15-2	M	10-0	70	Border	500	3' 00"	Adult
44	15-0	M	11-4	76	Border	509	2' 55"	Adult
45	13-0	F	11-1	85	Dull	333	2' 30"	Age 10
46	15-10	M	11-3	86	Dull	591	2' 30"	Adult
47	13-5	M	9-5	71	Border	351	3' 20"	Age 10
48	8-4	M	7-11	95	Normal	419	0' 00"	Age 13
49	11-0	M	10-10	99	Normal	583	0' 00"	Adult
50	8-5	M	8-2	97	Normal	502	0' 00"	Adult
51	8-9	F	12-7	144	V. Super	578	0' 00"	Adult
52	12-6	F	15-9	126	Super	583	0' 00"	Adult
53	15-5	F	9-10	64	F. M.	403	0' 00"	Age 12
54	11-2	F	9-1	81	Dull	251	0' 00"	Age 8
55	6-0	F	4-8	78	Border	000	0' 00"	Below 5
56	19-0	F	12-0	75	Border	518	0' 00"	Adult
57	13-6	F	14-4	107	Normal	509	0' 00"	Adult
58	10-0	M	7-9	78	Border	10	0' 00"	Age 5
59	20-3	F	11-0	70	Border	583	6' 00"	Adult
60	9-0	F	.....	100	Normal	429	0' 00"	Age 13
61	11-0	M	7-6	69	F. M.	262	6' 08"	Age 8
62	11-0	M	7-3	66	F. M.	446	4' 06"	Age 15
63	9-6	M	9-10	104	Normal	473	5' 44"	Adult
64	12-8	F	9-6	75	Border	436	6' 03"	Age 15
65	11-10	M	16-3	138	V. Super	489	3' 36"	Adult

However, these facts can better be stated by making but two statements as follows: of the 65 cases:

29 or 44.44 per cent give the same "rough" classification.

36 or 55.56 per cent give different classification.



The same thing may be briefly tabulated in a rough correlation table as follows:

Terman Binet Rating	Healy Picture Completion			
	Superior	Normal	Inferior	Total
Superior.....	3	0	0	3
Normal.....	7	2	2	11
Inferior.....	21	8	22	51
Total.....	31	10	24	65

If we now work out the coefficients of correlation by the products moment method we find.

The correlation between Binet I.Q. and Healy Score:  $r = +.15 \pm .082$ .

The correlation between Binet I.Q. and Healy Time:  $r = -.05 \pm .093$ .

Again we note the same facts stated above. The correlation between the Binet Standing and the Healy Picture Completion scores is insignificant, the probable error being twice as large as  $r$ . The same thing is true in comparing the Binet Scores and the Healy Picture Time records, only here is a negative correlation.

What is the significance of these results? Apparently one thing is demonstrated, namely, that the two types of tests are testing something very different. Are they both "General Intelligence" tests? If so then we must at once admit that our conception of general intelligence is capable of being split up into KINDS of general intelligence, or deny that one of the tests is really testing general intelligence.

One of the most suggestive papers the writer has read during the past year is that by Thorndike.<sup>1</sup> He notes that we may conceive of general intelligence (1) as an abstract, (2) as a concrete and mechanical, and (3) as a social general intelligence. While we do not believe that one is justified in making a "social" general intelligence (it seems to be making more confusion in a concept that is already sufficiently confusing), we believe that there is ground for the twofold general grouping. Our results indicate that the Picture Completion test is the concrete and more mechanical form of test—it tests this "concrete" form of general intelligence. On the other hand the Terman Binet tests tap the "abstract" form of general intelligence far more.

That the Picture Completion test is easier seems evident from our data. Of the 65 cases, 34 get advanced standing (of their chrono-

<sup>1</sup> Intelligence and Its Uses, *Harpers*, Jan., 1920.

logical age) by the Healy test, while only two cases actually test below the Binet rating. If a child ranks at a given age by the Healy Picture Completion test, then he, in all likelihood, will test below age by the Binet (especially for children of lower mentality).

In a series of studies in the public school which the writer has made recently, using the Picture Completion test and other performance tests, it was noted that the children who did well on the Binet tests, did well in school work demanding abstract thinking, as arithmetic, and language, whereas this did not at all follow when the child stood even much advanced by the performance tests.

Time and again we have found a child definitely feeble-minded by the Binet scale and three or four years advanced by the Picture Completion test. That the results of the tests warrant a conception of a two-aspect general intelligence seems reasonable.

We are all familiar with the individual who does well in concrete situations. The boy does well in the manual training room, surrounded by concrete objects, but is utterly incapable of following out any line of abstract thought. We all know the "common sense" person, the good substantial citizen possibly, who can't engage in abstract thinking to save himself. These people do well on such a test as the Picture Completion Test.

One might dare theorize somewhat as follows: in the evolution of the race the ability to engage in abstract thinking, to handle abstractions, is the very acme of mental development—it is a step past the more primitive concrete mind! We believe we are dealing with more than a mere difference in training here, also. If the preceding statement is at all valid, we might very well place the ability shown in the Terman Binet Tests above that shown in the Performance test; indeed we would seem justified in regarding the abstract form of general intelligence as superior to the more concrete.

#### SUMMARY

1. Extremely different ratings result from the Terman Binet and the Healy Picture Completion Tests.
2. The Picture Completion test is easier.
3. The tests seem to test different things, which suggests a concrete or inferior type of general intelligence, and an abstract or superior type or development of general intelligence.
4. As it is the abstract general intelligence that is taxed most in our schools, it is probable that performance tests are very inferior to the Terman Binet Tests, in the way of predicting the child's school career.





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## INTELLIGENCE RATINGS BY GROUP SCALES AND BY THE STANFORD REVISION OF THE BINET TESTS

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The results reported here were obtained by the use of two groups scales for the measurement of general intelligence, *viz.*, the Army "Alpha" and the newer "Chicago" scale of Freeman and Rugg. The individual tests were made with the Stanford Revision of the Binet-Simon scale. The number of subjects used totalled about one hundred and twenty although only 116 took all three tests. The results for ten additional subjects in advanced grades are not included since the chronological ages of this small group were so near to the upper limit of the Binet as to render the mental age scores relatively too low and would therefore operate to lessen the reliability of measures of correlation. It was originally the intention to include other group scales but this idea was finally given up because of the large danger of introducing marked practice effects owing to the fact that most of the group scales in existence today are quite closely patterned after the Otis and Army scales. It is believed that the practice factor has been largely overcome in the use of the two group tests here reported by the plan used of giving half of the subjects the Alpha test first and to the remainder the Chicago scale first. Part of the individual examinations immediately preceded the group tests and part were subsequent by a few days in point of time. The individual tests were all given by the writers together with the assistance of Mr. G. E. Finnerty and Professor B. W. DeBusk, both of this University. The group tests were given by one of the writers (Ruch) and

the exact procedure of the "Examiner's Guide" and that of Freeman and Rugg was followed in giving the respective tests.

The pupils taking part in the tests comprise all of the junior division, *i.e.*, seventh, eighth and ninth grades, of the University of Oregon High School. For the reason given above, the older pupils were not included. Although the number of subjects used is comparatively small, nevertheless, it is believed that the fact that the same subjects were used in all the tests gives the results greater reliability than the size alone of the number might indicate.

A few statements about the nature of the Chicago Group Intelligence Test may serve to throw light on the comparisons given below since the test is of quite recent origin. As far as the writers are aware, the Chicago test is frankly an attempt to revise the Army Alpha in such a way as to increase its usefulness with school children. The changes as we view them are in brief:

1. The shortening of the time needed for giving the tests from about 40 or 45 minutes to about 20 to 30 minutes.
2. The elimination of four of the tests of the Army scale, *viz.*, No. 1, "Directions Test;" No. 2, "Arithmetical Problems;" No. 5, "Disarranged Sentences;" and No. 8, "Information" test.
3. Changes in the mechanical make-up and in the matter included and eliminated in the four tests common to both scales, *e.g.*, "Number Completion," "Opposites," "Analogies" and "Best Reasons." In the case of the first mentioned, the changes are considerable and probably introduce very different psychological factors. That this last is also true of the other changes is, of course, just as possible although mere inspection would seem to indicate that the changes here take on more of the nature of mechanical rearrangement.
4. The addition of a "Proverbs" test not included in the Army scale.
5. Revision of the directions given to the subjects before each test resulting in a very marked shortening of the spoken directions in some cases. In some cases this involves the elimination of part or all of the examples worked out together by examiner and subjects before the test is actually begun.
6. The elimination of military terminology and demands upon knowledge ordinarily not possessed by civilians.

Of the changes listed above, the one of greatest advantage in actual school practice, perhaps, is the shortening of the time needed to give the tests. School administrators are much more likely to

make extended use of the idea of intelligence testing if too much time is not required. At the same time a high degree of reliability must be maintained. This latter involves a number of important considerations, many of which have never been seriously studied, and a few of which can be mentioned here in passing: first, the question of short time versus long period testing, the reliability of the test as a whole as shown by the correlation coefficients with individual tests, teachers estimates, re-testings, errors introduced by the giving of such tests by untrained examiners, differences in conditions under which the testing is done, and a host of others. To mention a single concrete factor, it has been shown that under favorable circumstances the reliability of estimates of intelligence can be made to show correlations as high as from .40 to perhaps .75 with the results of the most accurate individual test results. Needless to say that this method requires especially careful judgments and by virtue of this fact remains the exception rather than the rule, but, at the same time, this method does set a certain rough standard of reliability which any group test must meet in order to be justified in its widespread use in the schools. After making the due allowance for error attending the use of a group test under the widely varying conditions obtaining throughout the schools taken as a whole, there must exist a fairly high degree of reliability in comparison with the best available methods of rating general intelligence,

Some of these points will be referred to again in the discussion of the correlation coefficients actually found in this study.

In making the correlations reported here, it was thought that, everything considered, the most reliable measure of intelligence was that of the mental age as determined by the individual Binet examinations. All of the coefficients are obtained from this basis. Likewise the reliability of the separate tests was measured against the mental age findings. Table I shows the Pearson coefficients for the two group scales in relation to the Stanford Binet.

TABLE I

Showing the Pearson coefficients for correlation between the mental ages as obtained by the Stanford Revision of the Binet-Simon tests and

Army Group Examination Alpha.....	0.728 $\pm$ .033
Chicago Group Intelligence Test.....	0.622 $\pm$ .038

In table II, we have computed the coefficients of the five separate tests of the Chicago scale with mental ages, and in the cases of four of



these tests which are common to both group scales the coefficients for the corresponding alpha tests are given for comparison. The numbers in parenthesis refer to the numbering of the tests in the separate scales. It must be remembered here that the tests compared, *e.g.*, the "Opposites" of the scales are not exact equivalents in the two scales; and that in some cases, the amount of revision is very great and is undoubtedly accompanied by considerable differences in the exact psychological natures of the pairs of tests compared here.

TABLE II

Showing the Pearson coefficients of correlation between the mental ages as obtained by the Stanford Revision of the Binet-Simon tests and the separate tests common to both group scales.

Name of test	Coefficients of correlation	
	Chicago	Army Alpha
"Opposites" .....	(1) 0.372 $\pm$ .053	(4) 0.596 $\pm$ .042
"Number Completion" .....	(2) 0.368 $\pm$ .054	(6) 0.418 $\pm$ .052
"Proverbs" .....	(3) 0.479 $\pm$ .048	
"Analogies" .....	(4) 0.475 $\pm$ .048	(7) 0.460 $\pm$ .050
"Best Reasons" .....	(5) 0.400 $\pm$ .052	(3) 0.456 $\pm$ .050
No. taking test .....	118	116

It will be noticed by referring to Table I that the reliability of the army Alpha test is somewhat greater than that of the newer Chicago scale, the coefficients being, respectively, .73 and .62. This comparison is not necessarily to be interpreted as wholly unfavorable to the use of the Chicago tests since there is an important consideration involved in the question of the time factor in giving the tests. It requires approximately half as long to give the Chicago test. It is therefore entirely to be expected that the correlation of a brief scale will show a smaller coefficient of correlation than would a long-period test, all other things being equal. If economy of time is the most important factor in the practical use of intelligence tests, then, the brief scale has its advantages. If, on the other hand, accuracy is the prime desideratum, it is likely that the future will demand scales which occupy more, not less, time than present tests. Dr. E. L. Thorndike<sup>1</sup> has

<sup>1</sup> Thorndike, E. L.: Tests of Intelligence; Reliability, Significance, Susceptibility to Special Training and Adaptation to the General Nature of the Task. *School and Society*, 9, 1919, 189-195.

quite recently expressed his opinion on this question of the necessary amount of time for an entirely satisfactory degree of reliability to this effect. He would use a "fore-exercise" amounting to about 30 minutes for the purposes of equalizing previous training and insuring the proper kind of comprehension of the task to be done. The real test would then occupy about 200 minutes (on two or more days). Under these conditions the size of the P.E. can be reduced to a reliable value. The exact import of his contention is quite clearly stated when he says: "A correlation of .80, between general intelligence in a three hour test is probably as high as a competent person would hope to attain. If we placed persons in the first tenth, second tenth, third tenth, etc., of men on the basis of a correlation of .80, we should be wrong 73 times out of a hundred."

Table II shows that in three of the four tests common to both scales the individual tests of the army scale shows rather higher correlations than the separate Chicago tests with the Binet ratings. In the "analogies" test, the Chicago test is slightly superior. The most striking difference is in the "Opposites," where the coefficients are .60 and .37 respectively for the Alpha and Chicago. Such differences, notwithstanding the fact that our number of cases is small, would seem to indicate that there are significant changes involved in the reorganizations that Freeman and Rugg have made. The more mechanical changes in the form of the tests can hardly account for this degree of difference.

If the number of cases in this study had been distinctly larger, the attempt might have been made to advance some specific criticisms of the separate tests. Since the data is not at all adequate for this purpose, we shall only suggest a possible explanation for some of the relatively low correlations in certain of the separate tests of the Chicago scale which was thrust upon us in the course of actually giving the tests, *viz.*, the fact that a very considerable number of pupils of relatively high grade ability failed to comprehend the significance of the oral and printed directions as examiner and subjects read them together and because of this fact made poor scores. That a certain number should fail to comprehend directions is to be expected although these would in most cases tend to be pupils of relatively low grade ability. In the case of test 3, "Proverbs" of the Freeman-Rugg test, there were 24 zero scores in 118 test papers, or about 20 per cent. That the same tended to hold true in other cases is shown by the distribution reproduced here for test 2, "Number Completion" in the Chicago scale.

In this case the number of failures is smaller, but thirty others make only one correct solution (weighted score of 2) thus establishing the empirical mode at 2.0, although the mean and median are, respectively, 5.7 and 6.0.

TABLE III

Correlation Table for Chicago Test 3, "Number Completion" with Stanford Binet Mental Ages.

Mental Age—Stanford Binet

Score in Chicago, Test 3,—“Number Completion.”		Below 10 years	10-0 to 10-11	11-0 to 11-11	12-0 to 12-11	13-0 to 13-11	14-0 to 14-11	15-0 to 15-11	16-0 to 16-11	17-0 to 17-11	18-0 to 18-11	<i>f</i>
14	..	..	..	..	..	..	1	2	..	1	..	4
12	..	..	..	..	..	1	2	..	1	2	1	7
10	..	..	..	..	2	..	4	2	5	1	2	16
8	..	..	..	1	1	..	3	..	4	2	..	11
6	..	..	1	1	..	3	4	5	2	5	1	22
4	..	..	..	3	2	5	5	4	3	..	..	22
2	1	2	1	1	2	4	10	5	3	1	1	30
0	..	1	..	1	1	4	..	..	..	..	..	6
—	—	—	—	—	—	—	—	—	—	—	—	—
<i>f</i>	1	4	6	8	17	29	18	18	18	12	5	118

Analyzing the foregoing table a little further it might be shown that a score of 2.0 is virtually of little significance as a measure of any real accomplishment in the number completion test since the first test series is almost identical with one explained in the directions, thus:

1 2 3 4 5 .. 7 8 9 .. 11 12 13 (Form B)

is identical with the series explained in the course of the oral directions save that there the missing numbers are 10 and 13. It would seem that if a pupil has comprehended the import of the directions at all that he should have little difficulty in passing the first series, thus scoring 2.0, and that the score would represent but little real achievement. In this particular instance there was some definite evidence of misunderstanding of the oral directions as a number of pupils spontaneously informed the examiner of the fact. As still further



light on this point is the fact that examination of the test blanks showed that, in the large majority of cases, the pupils who failed of substantial scores in the test had attempted to fill in every series by adding one to the preceding number. Each of these points were not true of the Alpha, or if true, to a minor extent.

On the other hand, by mere inspection of the two number completion tests as they occur in the two scales, the writers both share the feeling that the Chicago test is superior to the corresponding one of the army scale because of a more uniform progression in difficulty. This should result in greater diagnostic and differential value. It should be noted that the time limit in this case is the same as for the corresponding Alpha test, *i.e.*, 3 minutes. The number of test series is smaller but are finally more difficult.

If our data were more adequate in point of quantity, the attempt might be made to explain away this irregularity in the correspondences of the three intelligence tests under consideration. However, we shall merely advance the suggestions that, if our findings should be duplicated with further use of the Chicago tests, that it might be interesting to learn the effect of amplifying the oral and written directions to the tests so as to cover more types of examples, *e.g.*, in the "Proverbs," explain by an example each of the three relations to be marked "S," "O" and "N," respectively (*i.e.*, same meaning, opposite meaning, no relation). The position is suggested as valid that initial comprehension of the task to be done should not be allowed to influence too greatly the score in comparison with the actual degree of success in the performance of the task, once it is comprehended. A fairly close approximation to a normal distribution should be one criterion of a good test provided the correlation is moderately high between the test and other standard measures of general intelligence. A tendency for the scores to group about some low value might, then, be taken as indicative of low comprehension value for the test directions. At any rate in the case under discussion, we do find a fairly uniform distribution of mental age scores (considering the magnitude of N) along with rather badly skewed distributions in some of the separate tests of the Chicago scale.

For the sake of comparison the various distributions referred to in the foregoing are reproduced. It will be noted that the irregularities in the distributions of the separate tests of the Chicago scale do not appear in the distribution of the total score for the scale and hence the suggested criticisms above do not apply.

One final point should be raised as a possible answer to some of the irregularities in our findings, *viz.*, that the group tested is not a typical sampling of children of the ages represented. This is admitted. The pupils of the University High School at Eugene represent beyond doubt a composite group. This is shown in tables V and VIII where the mental age and distributions are compared with the results obtained by other investigators. What effect the fact of a composite group might have as causes of the irregularities mentioned above, we are forced to leave as conjectural. It would seem that the identity of subjects used in all three tests would remove this as a casual factor in the skewness of certain of the curves of distribution.

TABLE IV

The distribution of mental and chronological ages of the 121 pupils represented in the three junior high school grades of the University High School, Eugene, Oregon.

Age.....	9	10	11	12	13	14	15	16	17	18	19	20
C. A.....	0	0	4	24	37	24	18	7	5	0	1	1
M. A.....	1	4	6	8	19	30	18	18	12	5	0	0

TABLE V

The distribution of the scores in army Alpha for 116 pupils of the three junior high school grades of the University High School, Eugene, Oregon.

0-19	20-39	40-59	60-79	80-99	100-119	120-139	140-159
1	2	13	27	29	24	15	5

TABLE VI

The distribution of the scores in the Chicago test for 118 pupils of the three junior high school grades of the University High School, Eugene, Oregon.

0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79
1	12	22	31	27	12	11	2

TABLE VII

Median scores in the several tests. Number of pupils varying from 116 to 120.

C.A.	M.A.	I.Q.	Alpha	Chicago
13-11	14-9	107	89	38

TABLE VIII

The distribution of the IQ's for the 121 pupils of the University High School, Eugene, Oregon in absolute numbers and percentages compared with the distributions for Terman's<sup>1</sup> 905 unselected school children and Chase and Carpenter's<sup>2</sup> composite group at Chapel Hill, North Carolina.

<sup>1</sup> Terman, L. M.: "The Measurement of Intelligence," p. 66.

<sup>2</sup> Chase, H. W. and Carpenter, C. C.: The Response of a Composite Group to the Stanford Revision of the Binet-Simon Tests. *Journal of Educational Psychology*, 10, 1919, 179-188.

I.Q.	University High School, Eugene		Terman	Chapel Hill
	Number	Percentages		
56-65	2	1.4	0.33	1.5
66-75	5	4.2	2.3	7.7
76-85	5	4.2	8.6	20.0
86-95	21	17.4	20.1	43.1
96-105	27	22.3	33.9	23.1
106-115	21	17.4	23.1	4.6
116-125	22	18.2	9.0	0.0
126-135	15	12.4	2.3	0.0
136-145	3	2.5	0.55	0.0

The data from Chapel Hill is presented in the above because of the fact that it resembles the distribution for the University High School in being a composite group. Both distributions differ from Terman's in that there are unusually large numbers of very low grade children. However, on the whole, the Oregon children are decidedly a superior group in comparison with children at large. The large numbers of superior children in the University High School can be explained in part at least by the fact that the school draws heavily from homes connected with the University of Oregon. Moreover one of the adjoining districts contains a large percentage of professional classes. Of the eight pupils from homes connected with the University, none have I.Q.'s less than 100 and but two below 120, the highest being 141, and the median for this group is 125. Of 16 other pupils from homes of professional people (doctors, dentists, teachers, lawyers) two fall below an I.Q. of 100, the range being 90-141 with the median of this group at 118. The seven pupils falling below an I.Q. of 75 come without exception from the homes of unskilled laborers such as loggers, janitors, wood-sawyers, day laborers, and the like.

It is to be hoped that other studies covering the junior high school grades will soon be available for purposes of comparison much as Terman and his pupils<sup>1</sup> and others have done for certain of the elementary grades and as Proctor has carried out for the first year of the high school.

<sup>1</sup>Terman, L. M.: "The Intelligence of School Children." Houghton Mifflin Company, Boston, 1919.



## TESTS FOR MENTAL ALERTNESS

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"To do things quickly *and* well is more than to do them quickly *or* well"—Baldwin.

The present study is an attempt to present simple tests based on conditions closely comparable with school work and capable of being administered as a mass test by an untrained and inexperienced examiner. The purpose for which the tests were designed was to determine to what degree retardation in elementary schools is caused by, or at least accompanied by mental inertia, or slowness in regard to simple tasks. Its use, however, does not seem to be limited to this original purpose. The difficulty of getting a set of exercises comparable with school work and yet adapted to all the pupils is not small. It has not been fully accomplished in this attempt. That it has been more nearly approached than in some, is firmly believed.

The material used in this study was a short story prepared by the writer (Test 1), and a set of exercises based on the story (Test 2). The two exercises were printed on opposite sides of a sheet of paper  $8\frac{1}{2} \times 11$  inches, and each child tested was supplied with a copy. Directions were given orally and were likewise printed with the tests. For the first test space was left on the page for the pupil's reproduction.

Directions for Test 1: "Read the story through till you are sure you know it well. When you have finished, please cover the story with a book or paper, and tell it in your own words in the space below. Do not look at it again till you have finished writing."

### A STORY

"Mr. Adams once gave work in the store to two young men named William and James. James would stand outside of the door in the morning till the work bell had rung. He would quit work just as the bell rang in the evening. William was always ahead of time in the morning. He would finish his work in the evening even after the bell had rung. James always grumbled about his work. William would whistle and smile as he did everything that was asked of him. Now one of the young men is walking the streets looking for another place to work. The other is part owner of the store. Both boys had the same chance in the beginning."

TEST 2

Directions for Test 2

The following are questions and exercises based on the story. Read them carefully and answer them or do what it says to do. Read the story again if you want to. Look at it as often as you care to while you work.

1. Which boy is now part owner of the store?.....
2. Draw a line under the name of the boy who lost his job and also under the word which tells why.  
William          James          careless          cheerful
3. How many people are mentioned in the story?.....
4. Place a square around the words below which tell why one of the boys succeeded:  
early          late          obedient          grumbling
5. Place a line under the word which tells what William was doing while James was standing outside the door.  
eating          smoking          working          resting
6. Under each of these words put the first letter of the name of the young man whom it best describes:  
grumbling          whistling          industrious          lazy
7. Make a word out of the first letters of the names of the three people mentioned in the story.....
8. At the first end of the line below write the first letter, and at the last end the last letter of the name of the boy who would quit work just as the bell rang in the evening.
9. If both boys pleased the merchant, draw a circle around the one of these letters which comes first in the alphabet:  
G                          B
10. If neither of the boys succeeded, make a word out of the three letters below; but if one of them failed, cross out the longest word in this sentence:  
s   y   e
11. One of the boys has opened a bank account. Which do you think it is?.....
12. Fill the blanks below with the names which you think ought to be there:  
".....spent his evenings at home with reading and music.  
.....could be found with idle companions any evening after supper."

13. Finish this sentence as it should be: "Both boys had the same chance in the beginning, but....."
14. What ought to be the title of the story?.....
15. If James knows why he failed and wishes to succeed when he gets another place to work, give, with a single word, one of the things he must do that he did not do, and, with another single word, one of the things he must not do that he did before.....

*Description of Tests.*—It will be observed that the story is systematically designed. The introductory sentence is isolated from the others and gives a complete introduction to the story—naming the characters and setting the scenery. The two boys are named in the one order, but are taken up in the opposite order. This was done intentionally as a catch for the unwary. Two statements are made about James—the second using the pronoun. In like manner, statements are made about William. Then the two are again named in successive statements. Following this they are referred to as "the one" and "the other" without being named, but the reference is so obvious that few people in the recall note the fact that they are not named. The story closes with a simple isolated statement about both the boys and is, in a way, comparable with the first. These thoughts are not equally difficult to reproduce. This is particularly true of the last thought,—the story in the minds of many seeming to be complete in reproduction without the addition of that last reflection.

An examination of the questions and exercises in Test 2 reveals that it is at least thoughtfully if not wisely planned. Many people missed No. 3. By the phraseology at the beginning of No. 5, the idea of a "Square" is carried over from No. 4 and induces a very common error. This seems to be intensified by the fact that No. 2 had employed the "line under" reaction. No. 7 is a correction of No. 3 if an error had been made there, but is seldom noticed by one taking the test. No. 9 is probably the most treacherous point in the test due to the fact that the child loses the full force of the conditional clause in his attempt to get the directions clearly in view and interpolates an adversative direction to circle the letter which comes latest in the alphabet. This is increased by the fact that the child feels called upon to do something in the presence of every situation presented. Considerable liberty is granted in the answers to Nos. 13



and 14. No. 15 is extremely difficult in that the answers, at least one of them, will indicate what James must *be* rather than what he must *do*, or will contain more than one word. It is certain that the parts of Test 2 are not of equal difficulty, and they have been weighted each with its own value, though the weighted values do not figure in this study. The results are quite encouraging with the test as it is, and is, therefore, given this early presentation. All future use should employ the weighted values in scoring. For the fifteen parts of Test 2, the weights are 1, 4, 2, 5, 5, 8, 8, 6, 9, 5, 3, 4, 3, 5, 12, respectively.

*Scoring.*—The score in Test 1 depends on the number of complete thoughts properly reproduced in the pupils' version of the story. A perfect score is ten, the number of thoughts in the original. In the second it is the number of questions properly answered—any error or failure to follow directions invalidating the entire answer for the question in which it occurs. In each of these tests, the time from beginning to end was taken by the teacher passing through the room, and, as a child finished, marking the time upon the paper. In Test 1, the time for the whole procedure of reading and writing was taken as one interval. The justification of this lies in the fact that the directions are not unlike those of a school assignment. In it, one gets a measure of the child's judgment as to when he has properly prepared his lesson. If he spends too much time in studying his lesson his record is lowered by the amount of time he consumes in doing it. Whereas, if he spends too little time in study, his grade is lowered by the inadequacy or inaccuracy of his reproduction. There is a point of optimum efficiency in the balance of time for study and report. The child who finds it, makes optimum progress while those who fail on either side are handicapped. In like manner with Test 2, if the child goes slow and looks back frequently at the story, his accuracy may be improved, but his time is lengthened. The importance of this is seen in the method of securing a final grade from the scores and time records in each test. In each case the "score" forms the numerator and the "time" the denominator of a fraction while the resulting quotient is the index of ability in the test. This is here designated as an Alertness Quotient. Technically it is a "rate" by the formula in physics, "Work divided by Time equals Rate." It is here employed as an index of mental alertness. The pupil who scores the highest A.Q. must do a large amount of accurate work in a short time. A high degree of ability is thus shown by a large numerator and a small denominator, whereas, the lowering of the measure

of ability may be due to a decrease in the numerator (amount accomplished), or to an increase in the denominator (amount of time consumed).

Two people who score the same on accuracy, for instance two who get all of each of the tests correct, one in 7 and 9 minutes, the other in 9 and 10 minutes, respectively, have scored 143-164 and 111-150 respectively on the two tests. The final measures of ability show marked differences which the task accomplished did not reveal. Furthermore these measures are based more nearly on those things which make for promotion, demotion and retardation. In the tabulated results, the A.Q.'s appear without the decimal point or rather with the point moved two places to the right to avoid fractions. This does no serious violence to the measures since they bear no definite relation to any standard unity.

*Administration of Tests.*—The method of administering the tests was to furnish each teacher with a full set of instructions and cautions on giving the tests, complete directions for grading and calculation of A.Q.'s and blanks on which to make special report on the characteristics of the children in her room whom she considered exceptional—either retarded or accelerated. In the case of one large city where 4961 pupils in the fourth to seventh grades were tested the writer supplemented printed directions by an address before the principals of the city and by actually conducting the test with the principals in the way it was to be conducted with the children. In the smaller cities the work was done by the principals and superintendents who were doing cooperative research work with the writer. In all cases the original papers were sent in with the tabulated results and were inspected before the recorded scores were accepted. In most cases the work was faithfully and accurately done. In others it was necessary to revise the grading of all papers. Only grades four, five, six and seven of the public schools were tested, in any considerable numbers, though there is no reason why it would not be illuminating to use the tests in the higher grades and even in the universities. The preliminary results along that line are given without further discussion in table V.

Tables I, II, III and IV show summated returns from all school systems for the fourth, fifth, sixth and seventh grades respectively. Grade-to-grade improvement is very marked for both boys and girls as is also the superiority of the girls over the boys of the same grade. This sex difference is not well marked in the sixth grade but is clearly

set out in the other three. The same general tendencies are shown by each test and hold as generally true for the large school system as for the smaller ones.

TABLE I

Mental alertness quotients from fourth grade pupils in the nine cities reporting

City	Boys			Girls			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
S.A.....	804	42	50	718	46	56	1522	44	53
Tr.....	13	37	44	21	34	47	34	35	46
C.....	6	46	71	7	50	46	13	48	54
S.M.....	5	36	70	5	44	60	10	40	65
M.....	16	30	93	9	27	127	25	12	105
A.....	12	25	50	11	50	67	23	37	58
I.....	4	41	69	14	43	73	18	42	72
B.....	17	40	67	25	100	73	42	76	70
Te.....	10	44	71	12	52	61	22	48	66
Totals.....	887	41	52	822	47	58	1709	44	59

TABLE II

Mental alertness quotients from fifth grade pupils in the nine cities reporting

City	Boys			Girls			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
S. A.....	711	66	74	660	72	79	1371	69	76
Tr.....	14	56	50	11	46	112	25	31	77
C.....	3	53	76	13	40	100	16	43	95
S. M.....	6	145	235	10	190	370	16	181	313
M.....	7	67	82	19	72	100	26	71	95
A.....	19	73	111	20	57	98	39	65	104
I.....	14	50	69	17	51	71	31	50	70
B.....	11	83	110	22	90	112	33	88	111
Te.....	13	54	75	15	67	79	28	61	77
Totals.....	798	66	77	787	70	81	1585	69	77



TABLE III  
Mental alertness quotients from sixth grade pupils in the nine cities reporting

City	Boys			Girls			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
S. A. ....	508	99	99	605	101	100	1113	100	98
Tr. ....	8	75	94	17	17	112	25	76	106
C. ....	9	53	86	9	58	84	18	56	85
S. M. ....	8	275	297	3	227	308	11	261	300
M. ....	13	57	92	12	65	74	25	61	83
A. ....	11	86	106	19	81	112	30	83	110
I. ....	23	109	101	30	85	97	53	95	99
B. ....	28	91	110	37	89	100	65	89	104
Te. ....	5	46	98	6	100	124	11	75	112
Totals. ....	613	99	101	738	98	101	1351	98	101

TABLE IV  
Mental alertness quotients from seventh grade pupils in the eight cities reporting

City	Boys			Girls			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
S. A. ....	441	117	107	514	125	118	955	123	112
Tr. ....	8	74	98	23	85	115	31	82	110
C. ....	3	90	140	5	8	219	8	82	189
S. M. ....	...	...	...	15	167	162	15	167	162
M. ....	7	92	118	8	134	166	15	114	144
I. ....	13	111	134	14	125	139	27	118	136
B. ....	29	111	128	42	119	133	71	116	131
Te. ....	6	108	126	9	108	140	15	108	134
Totals. ....	507	115	109	630	124	122	1137	121	116

TABLE V  
Mental alertness quotients from all grades in which the tests have been attempted. Grade standards.

Grade	4	5	6	7	8	9	10	11	Fr.	Soph.
Number. ....	1709	1585	1351	1137	146	78	50	35	108	193
A.Q. test 1. ....	44	69	98	121	107	117	120	114	290	207
A.Q. test 2. ....	55	77	101	116	165	118	152	140	266	284

TABLE VI  
Age-grade scores for one large city

Aeg	Fourth grade			Fifth grade			Sixth grade			Seventh grade			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
8 B	7	49	80	1	40	44	...	...	...	...	...	...	8	47	76
8 G	10	46	57	...	...	...	...	...	...	...	...	...	10	46	57
9 B	82	46	64	5	72	78	...	...	...	...	...	...	87	47	65
9 G	116	54	72	16	70	86	1	125	143	...	...	...	133	65	74
10 B	239	41	52	82	68	90	7	111	83	...	...	...	328	46	60
10 G	231	41	56	89	74	96	7	123	133	...	...	...	329	54	68
11 B	210	42	48	229	68	75	59	95	110	6	96	119	504	58	67
11 G	188	44	53	256	72	82	99	98	112	15	146	152	558	64	77
12 B	138	37	46	172	64	67	183	89	92	77	121	120	570	66	74
12 G	83	37	42	170	73	77	235	96	102	119	117	121	607	79	86
13 B	73	30	31	122	59	64	143	90	89	167	107	111	505	70	76
13 G	58	48	39	84	58	50	156	91	90	187	121	116	485	85	86
14 B	35	29	29	65	52	60	82	78	76	129	110	100	311	71	74
14 G	33	29	32	40	58	64	78	71	80	132	117	101	283	78	79
15 B	15	25	22	17	47	41	16	86	89	55	112	90	103	69	67
15 G	6	42	76	13	38	40	31	83	82	59	122	99	109	88	83
16 B	2	37	32	2	58	69	6	69	86	15	97	82	25	76	75
16 G	4	28	20	3	32	18	7	51	61	16	91	85	30	60	59
17 B	1	19	50	...	...	...	...	...	...	5	86	82	6	59	73
17 G	1	19	15	...	...	...	...	...	...	1	112	88	2	50	43
18 B	...	...	...	...	...	...	...	...	...	1	80	133	1	80	133
18 G	...	...	...	...	...	...	1	91	108	...	...	...	1	91	108

Taking school S. A. as a basis for more careful study, many interesting facts may be discovered. First, the grade distributions indicate that pupils of this school system are making somewhat normal progress by grades and years. One is hardly prepared, however, for the grade results by scores to show that the younger pupils in any grade test so much higher than the older ones in such a measure of mental alertness. But such seems to be the case in every grade for both boys and girls and by both of the tests employed. Excluding the roughness of the curve at the extremities where the number of cases is small, there is a general downward trend of the magnitude of A.Q.'s as the older pupils in the same grade are tested. This can only mean that a pupil in this school system is promoted on the basis of his ability to do work rather than on the basis of the knowledge he has already acquired, of that the two things correlate well. The

TABLE VII  
Fourth grade scores for the schools of one large city (S. A.)

School	Boys			Girls			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
1	22	40	56	21	40	58	43	40	57
2	41	44	57	52	44	56	93	44	57
3	37	46	62	25	36	68	62	40	64
4	28	46	52	25	49	56	53	47	54
5	25	42	51	26	48	67	51	46	59
6	35	39	43	30	46	49	65	24	46
7	17	34	29	18	32	31	35	33	30
8	31	33	27	31	38	26	62	36	26
9	44	27	28	42	27	40	86	27	34
10	33	40	51	33	44	56	66	42	54
11	52	62	65	39	69	90	91	65	76
12	30	44	63	18	40	51	48	42	58
14	22	44	48	24	53	61	46	49	55
15	20	31	39	19	54	55	48	40	45
16	25	44	48	31	58	66	56	52	58
17	36	37	58	14	29	52	50	35	56
18	23	37	45	14	48	59	37	41	50
19	30	38	40	26	45	53	56	51	46
21	34	22	18	24	28	23	58	24	20
22	49	38	51	45	43	54	94	41	52
23	25	45	69	25	49	67	50	47	68
24	30	77	55	22	82	66	52	79	60
25	8	22	31	7	22	37	15	22	34
26	18	38	58	20	49	73	38	44	66
27	15	41	65	27	40	64	42	40	64
28	15	56	77	13	68	91	28	62	84
29	16	31	32	17	25	29	33	28	30
30	34	61	64	30	51	59	64	56	62
Totals (28)....	804	42	50	718	46	56	1522	44	53

writer's knowledge of this superintendent and of his philosophy of education makes the returns less suprising but none the less significant. At the same time, greater confidence is inspired in the probability that the tests carefully administered in any system will show actual conditions of promotion and retardation.

Tables VII to X show the reports of the various school units in this school system by grade and sex. There is considerable overlapping of the grade to grade scores between the various wards of the city. In general, however, there is a well marked superiority of the fifth grade



TABLE VIII  
Fifth grade scores for one large city (S. A.)

School	Boys			Girls			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
2	54	66	71	37	73	83	91	69	76
3	28	65	73	27	70	78	55	68	75
4	21	64	60	31	82	85	52	75	75
5	25	65	76	18	67	76	42	66	76
6	21	61	74	25	66	74	46	64	74
7	42	72	68	23	69	57	65	71	64
8	18	41	63	17	38	51	35	40	57
9	39	45	54	26	47	51	65	46	53
10	51	68	84	37	89	99	88	77	90
11	47	65	87	48	81	103	95	73	95
12	22	70	67	29	72	78	51	71	73
13	36	66	74	26	78	100	62	76	88
14	22	63	70	19	58	66	41	61	68
15	21	70	68	19	68	76	40	69	72
16	27	69	91	40	67	87	67	68	89
17	14	63	56	23	71	74	37	68	67
18	17	60	76	17	53	80	34	57	78
19	35	67	65	16	64	75	51	66	68
22	33	59	78	40	67	85	72	62	82
23	25	77	91	20	68	69	45	73	81
24	17	97	70	33	113	82	50	108	78
26	29	73	91	25	99	98	54	85	94
27	25	65	72	17	74	74	42	69	73
29	21	43	42	26	40	43	47	41	42
30	22	78	81	21	74	80	43	76	81
Totals (25)....	711	66	74	660	72	79	1371	69	76

median over that of the fourth, a like superiority of the sixth over the fifth and a less well defined difference between the sixth and seventh. This latter is not an uncommon finding and indicates that there is usually a residue of incompetent pupils left in the grade just preceding the high school. It will be remembered in this connection that Texas schools in common with most other systems of the Southern States, comprise only seven grades below the high school. There is, however, a very noticeable and significant feature of the results which was not anticipated and is not easily explained. Although no special effort was made in the beginning to have the two tests of equal difficulty, it is observed that the scores similarly calculated are somewhat compar-

TABLE IX  
Sixth grade scores for one large city (S. A.)

School	Boys			Girls			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
2	31	93	94	39	97	107	70	95	101
3	17	87	94	20	104	117	37	96	106
4	21	97	96	29	89	118	50	98	109
5	26	132	110	27	133	116	53	132	113
6	14	66	81	15	64	59	29	65	70
7	5	83	84	15	61	62	20	66	68
8	25	100	64	20	110	71	45	104	67
9	26	71	80	29	78	73	55	74	76
10	39	93	98	55	102	115	94	98	108
11	32	97	112	46	90	117	78	93	115
12	19	279	102	20	259	111	39	269	107
13	29	101	125	26	106	121	55	103	123
14	11	105	113	10	94	121	21	100	117
15	9	78	74	20	81	90	29	80	85
16	23	79	101	18	141	115	41	106	107
17	13	92	72	15	91	84	28	92	78
18	12	92	64	16	106	86	28	100	76
19	14	88	71	20	83	67	34	85	69
22	24	70	81	25	71	87	49	71	84
23	25	86	106	26	88	108	51	87	107
24	19	135	120	21	150	111	40	143	116
26	17	107	103	25	90	101	42	97	102
27	16	83	91	22	91	88	38	88	89
29	8	53	84	14	51	66	22	52	72
30	33	81	91	32	88	100	65	84	96
Totals (25)....	508	99	99	605	101	100	1113	100	98

able. The fourth grade does better on Test 2 where they were to answer certain questions on Test 1 where the task was learning and reproduction. The same thing is true of the fifth grade. In the sixth, however, the scores are almost equal for the two tests, while in the seventh grade, results are not only more scattered but are distinctly lower on the second test. Indeed the general plateau in the seventh grade seems to be occasioned almost entirely by the technical difficulties of the second test. Whether this is due to the character of the school training or to a pronounced lag in the development of the

TABLE X  
Seventh grade scores for one large city (S. A.)

School	Boys			Girls			Totals		
	No.	T-1	T-2	No.	T-1	T-2	No.	T-1	T-2
2	35	116	114	41	136	115	76	127	115
3	11	186	95	9	121	92	20	156	94
4	10	119	157	21	126	134	31	124	142
8	10	111	59	7	71	67	17	94	62
9	23	93	96	25	105	98	52	99	97
10	40	105	111	39	121	122	79	113	116
11	29	113	128	27	123	136	56	118	132
13	26	114	133	37	129	145	63	125	140
14	7	126	112	5	129	128	12	127	119
16	20	100	102	26	100	114	46	100	108
17	10	98	84	15	124	98	25	114	92
19	5	135	87	8	109	73	13	119	78
20 S	15	90	90	14	114	112	29	102	101
20 B	15	145	104	15	158	107	30	151	106
20 D	12	134	88	17	182	130	29	162	113
20 Sk	15	118	153	13	117	155	28	118	154
20 Rd	15	132	104	15	150	140	30	141	122
20 u	9	118	102	21	155	130	30	144	122
20 Rs	10	219	157	14	251	180	24	238	170
20 A	19	99	100	13	102	113	32	100	105
20 H	8	179	128	15	165	122	23	170	124
22	8	99	97	16	100	92	24	100	94
23	25	101	95	29	89	90	54	94	92
24	4	250	120	9	140	99	13	170	100
26	14	162	66	13	175	82	27	168	74
27	15	79	96	12	92	107	27	85	101
30	31	99	104	34	104	100	65	102	102
Totals (27)....	441	117	107	514	125	118	955	123	112

ability to follow definite directions, or to a general slump in the reading habits from attention to the small details to a grasp of the larger relations only, or to some still less easily defined cause is not certain. The fact is certainly significant of something, and deserves further investigation. Whatever it is, it seems to bear a close relation to the set of requirements thought to be essential for good high school work.

*Exceptional Pupils.*—Still another aspect to be considered is a study



TABLE XI  
Scores of pupils reported by teachers as being retarded

Grade	No.	Age	Yrs. in Sch.	T-1	St-1	T-2	St-2
Boys							
4	20	12	5.8	31	41	38	52
5	6	14.5	7.0	53	66	40	77
6	8	13.9	7.0	62	99	72	101
7	8	15.1	8.0	65	115	86	109
Girls							
4	17	13.5	5.8	28	47	44	58
5	6	14.5	7.3	32	70	44	81
6	7	13.9	7.9	80	98	50	101
7	6	14.8	8.5	121	125	95	122

TABLE XII  
Scores gleaned from records of retarded pupils

Grade	No.	Age	Yrs. in Sch.	T-1	St-1	T-2	St-2
Boys							
4	75	13.3	5.5	32	41	38	52
5	85	13.3	6.5	53	66	64	77
6	58	14	7.3	82	99	77	101
7	32	14.7	8.1	103	115	90	109
Girls							
4	54	13	5.8	30	46	39	38
5	57	13.4	6.5	51	72	61	81
6	38	13.8	7.3	80	101	81	101
7	33	14.8	8.1	98	125	88	122

of the scores made by those pupils whom the teacher in an "Exceptional Child Report" designated as either accelerated or retarded. Tables XI and XIII show these results in some detail. In Table XI the report on retarded pupils, every grade record is below the standard for the grade and sex. In Table XIII, the report on accelerated pupils, only one grade record is below the standard for the group. The result holds true for both boys and girls. This general result was, of course, to be expected if the tests were giving results closely correlated with the teacher's judgment. In other words, the pupils whom the teachers

TABLE XIII  
Scores of pupils reported by teachers as being accelerated

Grade	No.	Age	Yrs. in sch.	T-1	St-2	T-2	St-2
Boys							
4	14	9.6	2.9	59	41	75	52
5	12	10.8	3.3	101	66	120	77
6	8	11	3.9	99	99	114	101
7	9	12.8	4.7	109	115	139	105
Girls							
4	12	9.8	3.2	49	46	49	58
5	9	10.8	3.5	92	72	124	81
6	7	11.7	4.4	137	101	126	101
7	11	12.2	4.5	131	125	173	122

TABLE XIV  
Scores gleaned from records of accelerated pupils

Grade	No.	Age	Yrs. in sch.	T-1	St-2	T-2	St-2
Boys							
4	32	10.2	2.1	48	41	69	52
5	61	11	2.9	68	66	77	77
6	49	12.1	3.7	95	99	118	101
7	56	12.7	4.6	18	115	114	105
Girls							
4	38	10.1	2.06	45	47	100	58
5	64	11.0	3.0	70	70	75	81
6	71	11.6	3.8	110	98	104	101
7	93	12.8	4.8	127	124	123	122

consider retarded make a poor showing with the test. On the other hand those whom the teachers consider accelerated make a superior showing in the tests.

The original record sheets were then inspected and the retarded and accelerated pupils selected on the basis of age and grade in school. Assuming that a pupil started regularly and progressed normally one grade in one year, he was considered retarded if he was more than one year older than the normal age for his grade, and accelerated if he was more than one year younger than the normal age for his grade. Differ-

ences of a single year were not considered exceptional. These results are shown in Tables XII and XIV. The numbers are much more representative than those above and still show that, apart from the judgment of the teacher as to the retardation or acceleration of the child, the tests will differentiate them into accelerated and retarded groups. Again, in every case, except one, the grade for the group of retarded pupils is below that of the general average for the group for both boys and girls. In Table XIV in only three out of sixteen cases is the group grade for the accelerated pupils below that of the normal for the corresponding group.

#### CONCLUSIONS

From the results as they now stand, the following conclusions seem to be warranted:

1. The two tests combined form a fairly reliable measure of the pupils' ability to do ordinary school work.
2. The importance of general mental sluggishness as a factor in school retardation may have been somewhat overlooked in our search for causes among attendance statistics, teaching methods, etc.
3. The reversal of the relative difficulty of two such tasks from the fifth to the seventh grades is probably a symptom of some fundamental but hitherto undetected and undefined defect in the upper grade training. Since the tests are based upon silent reading, the result may be due to an uncompleted change in the general reading habits.
4. The tests in the time of a few minutes reveal the ability of the several members of the class to do general school work almost as accurately as the teacher by general observation can determine it after many months of intimate acquaintance. The use of the tests for the borderline cases between promotion and non-promotion would seem to be justified.
5. This diagnostic result is more reliable in relation to the subnormal than to the supernormal, but is quite satisfactory as a means of classifying this latter group.
7. The content of the story and the character of the exercises make the labor of the tests well worth the child's time. Many school tests certainly fail in this regard, and thus bring the whole experimental program into disrepute. Experience with this one is quite the reverse.
6. Reading difficulties preclude the use of the tests to any great extent below the fourth grade, but there seems to be no reason why its use cannot be extended to the higher grades even through the high school and into the University.



# AN APPROACH TO THE SYNTHETIC STUDY OF INTEREST IN EDUCATION: PART III

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## CHAPTER FOUR. SOCIAL MODIFICATION OF INTEREST

We have here to consider a second stage in the normal development of interest. Yet while the distinction between stages is largely genetic, as implying progressive development of primary biological tendencies, the present discussion must also trace from early childhood certain environmental influences which modify these tendencies. Such social influences as are implied by various forms of imitation and suggestion, both modify and select organic impulses at every age. It is accordingly important to note the effect of such influences upon the expression of adolescent interests and the consequent modification of types as previously described.

The significance of this new approach lies in the nature of the learning process. For the infant the purpose achieved and the knowledge gained are purely incidental products of the course of interesting action, performed experimentally for its own sake. Instinct provides the occasion and interest initiates the action. Similarly when the actions of others are reproduced, there must be postulated an acquired instinct<sup>1</sup> for imitation consisting of a fusion of such organic instincts as respond to occasions possessing qualities known as suggestive.<sup>2</sup> Imitation implies that another's actions are of interest in themselves. Their reproduction by the observer leads to recognition of the purpose and so to interest in the result. He thus rises from sensory to perceptual imitation and, when the model is absent, to conceptual imitation. Hence imitation regarded as a "social" instinct modifies experimental interests by rendering certain actions habitual and causing their ends to be taken-for-granted, so that learning proceeds with greater economy. Such modification occurs chiefly through the agencies of inner imitation or sympathetic insight, outer imitation, and suggestion, which facilitates both. Each of these agencies may be briefly noticed in turn.

Keatinge classifies imitative behavior under the headings of instinctive, conscious, and purposive,—the last including acts per-

<sup>1</sup> Not an inherited instinct. cf. W. McDougall, "Social Psychology," pp. 90ff; Ribot, "Psychologie des Sentiments," note 1, p. 238.

<sup>2</sup> cf. Keatinge's list, "Suggestion in Education," p. 56.

formed *per se*, for practical ends, and for reasons of self-esteem.<sup>1</sup> Instinctive or inner imitation differs from other forms both in function and in earlier appearance. Its function, in a word, is to bring about conformity to certain situations by inhibiting instinctive tendencies to dominate them. Such reactions are thus largely *adaptive*, as contrasted with the *aggressive* varieties of interest hitherto considered. These phenomena of instinctive imitation are conveniently classified as fellow-feeling with man (*einfühlung*), fellow-feeling with nature and absorption in the object (*einsföhlung*).<sup>2</sup> Since the process in each of these forms is relatively similar, the first alone may serve to explain the rise of interest in conformity. Fellow-feeling arises from the infant's response to differences in personality. "As early as the second month it distinguishes its mother's or its nurse's touch in the dark. It learns characteristic methods of holding, taking up, patting, and adapts itself to these personal variations. It is quite a different thing from the child's behavior toward things which are not persons."<sup>3</sup> By this awareness the child distinguishes between himself and others. Certain feelings associated with self are then attributed to others when they perform corresponding movements. Thus feelings of self and of other are mutually dependent. The adaptive self shares in the personality of others by assuming their attitudes so far as these have meaning from his own experience. He appreciates differences in such attitudes by virtue of his practical interest. To certain attitudes, those of his elders, he must at times submit. Those of his juniors, he may usually dominate. Practical interest in situations beyond his control is best realized by conformity and in other situations by aggression. The resulting action in childhood is merely the motor expression of a certain combination of elements and is entirely without moral significance.<sup>4</sup> Yet moral interest can only arise from the need of conformity to various social situations. The further development of this interest in conformity may now be traced.

At about the fourth year the child learns to identify his own reactions to situations beyond his control with others' reactions to situations within his control. He recognizes that certain of his own interests are shared by others. Conscious recognition of his own interest as seeking certain ends must allow others the privilege of seek-

<sup>1</sup> *Ibid.*, p. 86.

<sup>2</sup> Most satisfactorily perhaps by Baldwin, Lipps, and Mitchell, *op. cit.*

<sup>3</sup> Baldwin, "Mental Development in Child and Race," p. 335.

<sup>4</sup> See Lee, *op. cit.*, p. 240 regarding "the moral necessity of disobedience."



ing the same ends. At this stage his acts become socially significant. When the legitimate interests of others are opposed, he perceives that the other must feel as he does in such cases, and his sense of justice is accordingly offended. By fellow-feeling with the group he takes over their interests as his own and accepts their standards for himself to some degree. Here begins the compromise of the social life,—the adaptation of the group to his personal interests and the adjustment of these interests to the standards of the group.<sup>1</sup> This community of interest explains *loyalty* as the pursuit of one's own interests when these are sought by the group as a whole. As the group is progressively widened from the family to the playmate, the gang, the school, the town, etc., each new interest is first opposed by and then admitted to the fellowship of interests which at the time have become habitual. This equality of group interests implies the *moral* sense. Loyalty to group involves some sacrifice of conflicting personal interest. The satisfactions of successful conformity to group interests make the individual reluctant to aggress when the opportunity offers. Fidelity to certain personal standards of conduct is the condition of all group membership, which practical interest in superiority obliges him to retain. Such recognition of common interests further indicates the rise of purposeful conduct since the type of interest is determined by the social requirements of the situation. Whereas the expression of experimental interests is directed by necessity, social interest is largely regulated by success.

Such interest in conformity is well illustrated by the formation of clubs. The subordination of the individual is complete as is also his obedience to the "natural" leader, who holds his supremacy by power to express such interests as are most intense within the group as a whole. Membership implies a common sentiment against the offender, sympathy for the unfortunate members, and the preserving of group identity by special insignia, conventions, etc. Such deference to the group becomes universalized in fashion,—a conformity to the dictates of society in the large. Activities performed by the group intensify interest more than proportionately to the aggregate of individual interests expressed. Hence convention requires certain attitudes receiving group sanction to be taken-for-granted; thus

<sup>1</sup> This compromise is termed by Baldwin "the interest of learning." "It brings about through imitation, absorption, and trial, the progressive modification of personal habit in conformity to developing social ends." *Thought and Things*, III, p. 124.



modifying to some degree the natural expression of individual interest.

Returning to the conscious and purposive forms of outer imitation, we have to note the process by which certain experimental interests are selected for continued expression in the group. This process differs from the fellow-feeling just considered in that reproduction of another's actions does not imply reproduction of his thought. Such acts as are consciously reproduced are performed as a means of greater achievement and hence of greater social superiority. Aggressive attitudes are the rule and adaptive attitudes are taken only when such are necessary for continued self-expression. Yet with theoretical difference in function, the effects of both imitative processes are similar in that each gives rise to aggressive and adaptive interests. Hence inner and outer imitation are complementary, are instinctive in origin, and develop simultaneously. Some examples of experimental practical interests as expressed in group play may serve to illustrate this selective function of outer imitation more clearly.

Participation in playful or angry contests seldom appears before the third year and then usually in the form of feeble wrestling, yet a two year old shows pleasure in striking someone who pretends to be hurt.<sup>1</sup> Shortly after the third year this interest in *superiority* is revealed in all group play. Wrestling, shoving, racing, and all kinds of competitive games show that the fight is an end in itself.<sup>2</sup> The same interest lies in all resistance to authority, contradiction of elders and equals, and in such mental contests as board and card games when the element of chance is excluded. In games of pure rivalry, the fight interest is heightened by the feeling of jealousy. Interest in superiority here seeks the distinction of leadership; first, because others want it, and also because of the praise which recognition of superiority entails. Emulation differs from jealousy in that admiration is sought rather than love and often takes the form of boasting. "To lift heavier weights, to throw farther, to run faster, to jump higher, to make a top spin longer, to stay longer under water . . . is the burning wish of every childish heart."<sup>3</sup> Other varieties of interest in superiority occur in teasing and in assuming provocative attitudes towards those who may not be insulted by words.<sup>4</sup> Closely

<sup>1</sup> Groos, *op. cit.*, p. 174.

<sup>2</sup> O'Shea, "Interest in Childhood," *Child Study Monthly*, 11: 266-278.

<sup>3</sup> Groos, *op. cit.*, p. 199.

<sup>4</sup> *cf.* Chamberlain, *op. cit.*, pp. 262ff.

related is interest in the practical joke. The perpetrator has interest first in superiority to and then in fellow-feeling with the victim.

Such familiar behavior emphasizes the significance of interest in superiority, the social expression of experimental interest in achievement. The fact that in children this interest can find expression only in the society of equals renders it a powerful esprit de corps. Thus even the aggressive self implies an indirect group interest. Social recognition requires that certain personal achievements find favor with the group, and aggressive interests so sanctioned tend rapidly to become habitual, largely determining the child's early ambitions and ideals.<sup>1</sup> Outer imitation may produce interest either in the activity itself or in its result. The former involves intellectual experiment and the latter rivalry. Thus while outer imitation, like fellow-feeling, requires adaptation to group interest and hence the pursuit of social ends, its chief function is to select certain aggressive interests which in certain situations may safely be pursued to the end of personal superiority.

Before considering the theoretical effect of these phenomena upon the expression of experimental types of interest, the function of suggestion deserves comment. While suggestion no doubt offers a fairly adequate explanation of all imitative behavior, its separate treatment emphasizes the means by which imitation can be objectively controlled. Various qualities which render an idea suggestive, such as mass, break in continuity, expectedness, intelligibility, and pleasantness, are common to varieties of experimental interest. These qualities accordingly render any activity attractive, and the instinctive response thus produced accounts for imitation no less than other behavior. Yet the distinguishing feature of the suggested imitative response is its prepotency over other more habitual responses. Keatinge's definition explains this prepotency in terms of interest-intensity: "A suggestive idea is one which exercises a disintegrating (dissociative) influence on the mind in such a way that critical and inhibitory ideas are rendered ineffective. . . . The suggestive idea, while it need not be independent of knowledge, leads straight to action or belief."<sup>2</sup> Hence in neural terms the suggestive idea takes possession either by directly stimulating involuntary attention through sense appeal or by such non-voluntary reinforcement of previous dispositions

<sup>1</sup>cf. Darrach, *Popular Sc. Monthly*, 53:88; Monroe, *Education*, 18:259; Jegi, *Trans. Illinois Society for Child Study*, 3:131-144; Taylor, *Report State Sup't of N. Y.*, 1896; Barnes, *Studies in Education*, *passim*.

<sup>2</sup> *op. cit.*, p. 54.



that conflicting tendencies are inhibited. Certain typical conditions are evident. First, an idea becomes suggestive when its very remoteness from existing ideas is the fact attended to—witness the conjuror's movements and the emphatic statement of the orator who "takes his audience by storm." Second, the idea must avoid association with conflicting impressions and find association so far as possible, with favorable impressions. Also while the suggestion may be compatible with prevalent ideas, it must avoid over-emphasis. The effect of certain advertisements and of much class-room advice is often the opposite of the effect intended. A third condition is the subject's attitude toward the suggester, who should be trusted, loved, or feared. Confidence and love imply the medium of common interests, which alone tends to repress unfavorable associations. Fear carries conviction by sheer intensity of reinforcement. While the complexities of the dissociative process in suggestion are scarcely intimated by this summary, the outline should indicate the role of suggestion as a factor of social interest and something as to its relation to other factors discussed elsewhere. It should also be noted that, however offered, suggestion assists learning only in so far as the suggested impression is confirmed by voluntary effort of attention. Otherwise, as in hypnosis, interest in the new is transient and ineffective because unassociated with the old.

Behavioristic studies of adolescent interests in general have as yet established little more than the fact that such interests are the most diverse. No valid criteria exist to determine the relative frequency of various nascent social interests. All attempts to correlate such tendencies with instinctive impulse on the one hand and with mature behavior on the other must consequently rely on the consensus of theoretical opinion. To this end the simplest course will be to indicate somewhat schematically such sub-divisions in the types of instinctive interest as must in theory result from social modifications outlined in this chapter. Theoretically, then, each type contains two such sub-divisions distinguished by aggressive and adaptive social attitudes,—the former implying extrinsic interest in the situation itself as being of near or ultimate usefulness, and the latter implying an intrinsic interest in thought of the situation as being of such a nature.<sup>1</sup> Extrinsic interest thus regards the situation as a *means* of

<sup>1</sup> Intrinsic interest should not be confused with "purely intrinsic" interest, the term applied to the unmodified type of experimental interest in mere indulgence of feeling. The distinctions here made are taken directly from W. Mitchell's analysis, *op. cit.*, pp. 65-70.\*



realizing primary interest in any of the three types whose end may be either agreeable feeling, or desirable action, or meaning applicable to conduct. Intrinsic interest regards the situation as an end on account of the nature of the feelings, acts, or thoughts immediately involved. The character of these modifications may be suggested as effecting each type.

As applied to the practical type, we have seen that individual interest may become socialized either by becoming partly identified with that of the group, so as better to make use of a particular situation or by partial conflict with that of the group, which involves thought of the situation and justice to the interests of others concerned. The former experience expresses the extrinsic or *purely practical* interest in the utility of the situation as means to an end and includes such aggressive varieties as pursuit, emulation, rivalry, *et al.* The latter expresses the intrinsic or *moral* interest in the situation as it is thought or as an end in itself, and includes such adaptive varieties as obedience, loyalty, self-control, consistency to personal standards, *et al.* This interest also perceives such qualities as bravery, deceitfulness, and cowardice as these affect conduct, for this is a strictly practical consideration when applied to others.

Cognitive interest in a perplexing situation instead of seeking the acquirement of knowledge as such, may seek to understand it as affecting future conduct. Interest attempts to relate the situation to habitual experience and place it in the system in which it belongs, as in the discovery that drunkards may be good men and preachers the reverse. Such interest of the extrinsic sort may be termed *rational*. This is related to objects as real, as having a certain identity. When the intrinsic interest is exclusively vested in the knowledge itself, it may be termed *purely theoretical*. It implies "interest in a truth which a thought claims or seeks." This close relation between moral and rational interests as distinct from the purely practical and theoretical, suggests the normal distribution of social interest regardless of type. The latter forms may represent the survival of selected experimental interest in the social stage.

Because of the primacy of purely intrinsic interest in all experience, the intrinsic elements of the practical and cognitive types constitute social modifications of the purely intrinsic type. When absorbed in a situation—whether in landscape, music, or drama—our interest is expressed largely in the indulgence of feeling, and this element, the aesthetic, is therefore constant. When interest seeks only abstrac-

tion from reality, the experimental interest in pure sensation is continued without appreciable change. Yet surrender to feelings because of their relation to reality implies the introduction of a relatively extrinsic element. Thus contemplation of the character of Jesus may produce in the man of piety a state of absorption in which his own moral interest in self-sacrifice for the many becomes the occasion for the affective indulgence. The philosopher may in the same instance be absorbed in the theoretical significance of self-realization. Hence the subdivisions of the purely intrinsic type may consist of aesthetic, moral, and theoretical interests.

Social interests imply a certain degree of physical maturity, for one reason in that development of the ductless glands is connected with control of emotional reactions. Hence from the time when aggressive interests are first to some degree identified with adaptive interests, normal development implies the increasing control of the latter until an approximate balance is reached. Thereafter behavior is directed by such interests as are rendered habitual by successful expression in the particular environment. Certain phenomena of such expression are next to be considered.

#### CHAPTER FIVE. SOCIAL EXPRESSION OF INTEREST

The varieties of social behavior are identical with life itself and as such defy classification by means hitherto employed. For this reason the following description of the approach to a study of habitual interest makes no attempt to correlate specific phenomena, but instead seeks to indicate certain tendencies that govern the later expression of interests already distinguished. More concretely, we are to consider the nature of certain reactions to success and failure in environmental adjustment. The effect of these reactions is understood to determine the balance between aggressive and adaptive interests by which habitual attitudes and, in a sense, character become established.

That all growth and hence all behavior depends essentially upon the interaction of aggressive and adaptive attitudes variously defined, is well supported by both scientific and empirical evidence.<sup>1</sup> While the two attitudes are present as common elements in most situations, there are other situations in which one attitude may find expression to the practical exclusion of the other. The freshman from a provincial high school must for the most part conform to the new demands

<sup>1</sup> cf. Brewer: "The Vocational Guidance Movement," p. 105.



of university life. In his senior year aggressive interests may seek more fully to realize personal superiority: yet their fullest expression is resisted by various social influences whose existence has been taken-for-granted. This familiar experience suggests that the ratio of aggressive and adaptive interests explaining the individual's behavior in particular situations, is determined by the degree of such resistance.

The use of the term "resistance" in connection with the expression of social interest at once suggests the application of psychoanalytic theory. Quite apart from its still discredited practice and most of the sex diagnosis involved,<sup>1</sup> the central notion of this theory contains much of approved value. Such indirect applications as have been made in the fields of industry by the late Carleton Parker and A. H. Southard among others, in medicine by numerous British and American psychiatrists chiefly in connection with war neuroses, and still more recently in education by the English writers, H. C. Cameron,<sup>2</sup> C. W. Kimmins,<sup>3</sup> and St. G. F. Pitt<sup>4</sup>—have largely vindicated the underlying principles as helpful approaches to problems of social readjustment. It may further be noted that the effect of many excellent critical treatments<sup>5</sup> has been to remove the arbitrary distinction formerly made between normal and abnormal cases. While unquestionably the value of the remedy depends upon the abnormality of the case, it is widely recognized that the same phenomena appear in the so called normal cases to some degree. Confidence is therefore justified in such clearly operative principles as apply to the social expression of interest.

Fundamental in this notion of the unconscious is the view that all mental activity implies a life impulse, variously defined, which is the force that reveals itself as interest. "It is with the utilization, expression, and application of interest that the unconscious continually concerns itself."<sup>6</sup> By virtue of this biological source, the interest thus seeking expression is essentially instinctive and hence aggres-

<sup>1</sup> cf. McDougall, "Social Psychology," pp. 394ff.

<sup>2</sup> "The Nervous Child."

<sup>3</sup> "Children's Dreams."

<sup>4</sup> "The Purpose of Education."

<sup>5</sup> For example, the series of articles published in the *London Times Educational Supplement* commencing May 27, 1920.

<sup>6</sup> M. Nicoll, *op. cit.*, p. 83; see also W. A. White, "Mechanisms of Character Formation," pp. 118ff. for distinction between interest in directed and undirected thinking.



sive in nature. In situations beyond control, the expression of such interest is clearly impossible. It is resisted by the actual conditions that exist or, in a word, by reality. From this dilemma there are two means of escape; either the resistance may be overcome by such modification of interest as will bear social expression and hence conform to reality, or the resistance is not overcome. The anti-social interest persists in the unconscious at variance with reality, and conduct is out of alignment. Such forgotten "repressed" interest is thus a source of mental unrest which seeks comfort in the false assumption that its ends have actually been realized. The unsuccessful portrait painter, for instance, persuades himself that he has achieved a master piece,—by way of compensation for his failure. These phenomena of resistance and of compensation need to be considered in slightly greater detail as affecting habitual expression of interest.

The fact has been emphasized that the experience of resistance overcome is the occasion for all learning.<sup>1</sup> Opposition to ideas taken-for-granted means the thwarting of an expectation upon which interest depends, hence the mind is temporarily at sea. The error requires a return to the familiar from which a later excursion into the unknown may profit by the earlier experience. By this means the child arrives at certain distinctions fundamental to the concept of reality. The first experience of resistance to physical effort teaches the distinction between self and world and forms perceptions of various objects. Resistance to these perceptions and thoughts of objects teaches the distinction between experience and reality and gives conceptions of general truth. A much later form of resistance that violates these conceptions may be supposed to yield the intellectual discipline which anticipates failure by previous reflection. By this evolution from lower to higher forms, resistance when successfully overcome is the means of continually closer contact with reality and of the normally distributed interest this contact implies. The many recent applications of this principle to education in particular fields, of which Helen Marot's *The Creative Impulse in Industry* is typical, deserve study in this connection.

The degree of repression, *i.e.* of failure to overcome such resistance, depends upon the extent to which personal interests are in conflict with or dissociated from group interests. There are various causes for such dissociation.<sup>2</sup> Perhaps the first to appear is the resistance of

<sup>1</sup> W. Mitchell, *op. cit.*, p. 64.

<sup>2</sup> As distinguished by O. Pfister, "Psychoanalytic Method," Chap. V.

external conditions, which may be of such nature as either to prevent the continuance of an instinctive activity or to prevent its performance when required by further development. Such instances as the art lover's removal to a city without galleries, the financier's loss of capital by a turn in the market, and the scholar's loss of manuscript may illustrate repressions in each type of interest resulting from the former cause. The latter is illustrated by the younger boy's reluctance to enter games with his elders. As distinct from these external factors, repression may result from the moral interest or loyalty, which denies expression to legitimate interests from a mistaken sense of propriety. An example may be found in the group prejudice against the "grind" which opposes his practical interest to excel in school work. The resulting conflict between loyalty to the group and obedience to authority can normally have but one outcome,—the group triumphs. This distaste for authority as such is characteristic of all aggressive interest; hence the value of problem methods which avoid emphasis of the pupils' inferiority. In contrast to this preventive aspect, moral interest becomes a repressing factor in its punishing aspect. A conflict takes place between the unsocial interest expressed in the act and the inhibited social interest. The resulting psychic disturbance may lead either to another act of expiation or to repressing the fact of the misdemeanor. The pretense of virtue as a cloak to irregular conduct is thus the direct result of the guilt, since both thought and appearance of it are repressed:—witness Lady Macbeth, the proverbial instance of unconscious justification.

In "compensation" we have to consider a universal tendency of mind to disguise failures in adjustment to reality whether these result from the above typical causes or from others. Essentially the theory involved agrees with the metaphysics of Emerson's classic essay, yet it is entirely distinct from the "theory of compensation" as known to quantitative psychology. The latter in effect maintains that marked superiority in certain lines of achievement is usually offset by inferiority in others—a fallacy revealed by Thorndike.<sup>1</sup> As here used the term refers strictly to relative differences. Its nature appears in the universal tendency to exaggerate slightly one's income, social status, abilities, and other interests imperfectly realized. Such compensatory illusions, commonly known as "fantasy," have both favorable and unfavorable effects upon behavior. In childhood the fantasy is largely protective. The more sensitive the mind, the greater is

<sup>1</sup> *op. cit.*, p. 301.



the need for illusion to reduce the shock of reality. While in maturity this function sometimes serves the same purpose, as in reducing the shock of a sudden loss which otherwise might cause insanity,—its effects are usually undesirable. These effects are commonly described in the extreme forms of introversion and extroversion,<sup>1</sup> the former indicating an undercompensated type of behavior in which fantasy is not active enough, and the latter an overcompensated type in which the fantasy is too active.<sup>2</sup> The nature and extent of such fantasy are best determined when consciousness is unfocussed—whether by sleep, fatigue, drugs, or other agencies.<sup>3</sup> Introversion then implies a preoccupation with self which renders adaptation most difficult. "Interest persistently turns inwards, away from the contact of the world, and finds its easiest and most natural utilization in thought." Fear plays an important part in its impulses which tend toward self criticism and against emotional betrayal. The extrovert on the contrary accepts social interests spontaneously and without question. His life is largely superficial, but gains in breadth what it lacks in depth. It reveals a maximum of vigorous and impulsive feeling with a minimum of thought and reflection.

Between these widely opposed extremes the degrees of compensation are normally distributed, as indicated in Figure Two. From this it will be inferred that when equal in degree the combined effects of self-interest and social interest are most to be desired, as implying the successful but effortful over-coming of resistance which is the condition of fullest development. Hence abnormality in expression of habitual interest, leading to dementia praecox in the one case and to paranoia in the other, is seen to result when either adaptive social interest or aggressive self-interest becomes overbalanced. By reference to the types of social interest (see pp. 450) it will be noted that social interest for the introvert consists in preoccupation with his duties to society. External resistance is largely successful and his interest lies habitually in thought of situations to be met. It is therefore intrinsic and finds expression in the aesthetic, moral, and theoretical elements of this type. Moral issues are very significant, whatever

<sup>1</sup> White, *op. cit.*, pp. 217ff. compares these terms with numerous other equivalents.

<sup>2</sup> For helpful illustrations from school situations see Long: *Psychoanalysis in Relation to the Child. Journal of Experimental Pedagogy* (London), June, 1917.

<sup>3</sup> Most advantageously perhaps by day dreams, *cf.* J. Adams, *ibid.*, March, 1914 and Thorndike, *Educ. Psych.* (1910) p. 50; and occasionally by choice of reading; Hall, *Ped. Sem.*, 9:99 and Bell and Sweet, *Journal of Educ. Psych.*, 7:39-45.



standards may be, and social adjustment is achieved by force of intellectual grasp. On account of this self-critical tendency, a recognized deficiency in performance is likely to be overcome by persistent effort, after the manner of the poor student who becomes the successful teacher. The many exceptions to this course quite naturally result from the relative infrequency of this intrinsic social interest in its

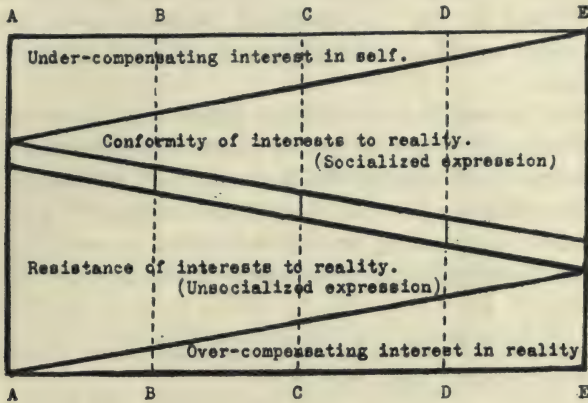


Figure Two. Illustrating the Socializing Effect of Resistance upon Aggressive Interest.

Explanation:

- A, B, C, D, E indicate degrees of resistance as normally distributed.  
 A indicates stage of maximum resistance to aggressive interests. Failure to realize is largely compensated by fantasy of success.  
 B indicates stage of normal introversion. Resistance to aggressive interests is partially overcome by conscious effort.  
 C indicates the ideal mean between intrinsic and extrinsic interests about which compensation centers.  
 D indicates stage of normal extroversion. Easy conformity to social interests only slightly compensated by fantasy and largely confirmed by actual success.  
 E indicates stage of minimum resistance to aggressive interests implying successful adaptation by which these interests are confirmed.

pure expression. For the extrovert, the effect of whose experience and mental disposition is such as largely to negate resistance, expression occurs in the extrinsic elements,—the purely practical and the rational. The ease of adjustment renders each situation primarily the means for continued instinctive expression. Hence moral issues are unlikely to arise and when they do they are decided by the standards of the moment. While the resulting inconsistency is opposed to social integration, such behavior illustrates the teaching of “conflict psy-

chology" with respect to mental hygiene; namely, "express every painful situation in a social way." "To know the better and follow the worse indicates a healthier state of mind . . . than that possessed by the individual whose ill-doing springs from repressed unconscious motives."<sup>1</sup> Yet in all behavior a purposeful overcoming of resistance is the best means of compromise between intrinsic and extrinsic social interest on which capacity for both moral and rational conduct depends. Hence in the standardized adjustment of resistance to meet individual needs lie the hopes of efficient education and of psychotherapy.

While this description of extreme types may have obscured the intervening cases to which its useful interpretation must apply, such plan of treatment is probably the best approach to the study of resistance and its effects upon habitual social interest. A final chapter indicates certain motivating principles implied in previous discussion and suggests corresponding hypotheses more capable of conclusive experiment.

<sup>1</sup> cf. Lawrence, The Theory of Repression and Character. *Journal of Experimental Pedagogy* (London), Dec., 1916, p. 62.

# LANGUAGE ABILITIES AND THEIR RELATIONS TO COLLEGE MARKS

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In view of the assertions of college teachers that college students of foreign born parentage are hampered in their work because of language difficulties and in view of statistical evidence that language difficulties are in some measure accountable for the lower marks and the greater amount of retardation among children of foreign born parents than among children of American parentage, the relations of language abilities has become a subject worthy of thorough investigation.

The present study is an attempt to determine the inter-relations of the abilities involved in theme writing, in reading for understanding of content, and in completing mutilated sentences, and the relations of each of these abilities or groups of abilities to marks received in a college course in rhetoric and to marks received in whatever academic courses had been taken by these students in the sophomore year of their college course.

The group of subjects consisted of ninety-eight sophomore students, eighty-six women and twelve men, registered in classes in general psychology in the College of Science, Literature and the Arts at the University of Minnesota. Since all had re-entered the University as sophomore students they may be considered a somewhat more highly selected and homogeneous group than the freshman class.

Of the marks made in the rhetoric course during the two semesters of the freshman year, ten were A's, fifty-two were B's, one-hundred were C's, twenty-nine were D's, and five were failures. In order to reduce the marks made in freshman rhetoric and also those made in the academic courses taken in the sophomore year to numerical values, the A's were given a value of 95, the B's a value of 85, the C's a value of 75, the D's a value of 65, and F's a value of 45.

The group of ninety-eight students was given two half hour periods in which to write two themes, one on the topic, "How I Earned Some Money" and the other on the topic "My One Extravagance." Each of the themes was rated for general merit by three college teachers of rhetoric with the use of the Thorndike Extension of the Hillegas Scale for Measuring English Composition. The final value assigned



to each theme was the median rating or the middle one of the three ratings assigned by the three teachers of rhetoric.

At the same time that the composition tests were given, two of the Trabue language completion scales—L and M—were also given, five minutes being allowed for each scale. Wherever the individual who scored the language completion scales felt at all uncertain about the value of a response a second person was consulted and the final score agreed upon by the two judges in consultation.

At other periods two reading tests requiring about fifty minutes each were given to the same group. The reading tests used were those devised by Professor J. M. Thomas and Professor M. E. Haggerty of the University of Minnesota. Each test consisted of six paragraphs with five questions of somewhat equal difficulty bearing on each paragraph. These tests had been worked out on the same basis as the Understanding of Sentences Test, Alpha II, by Professor E. L. Thorndike. The values extended from 9.3 P. E. to 11.0 P. E. By deducting 1.0 P. E. from the paragraph value in case the student missed more than two of the five questions in the easiest task, and adding 1.0 P. E. to the paragraph value in case the student answered correctly all five of the questions bearing upon the most difficult paragraph, the range was extended to from 8.3 P. E. to 12.0 P. E., a distance approximately equivalent to that between the median achievement of the fifth grade and the median achievement of the fourth year of high school, and wide enough to include all in this group. Each reading test was scored by three college teachers of rhetoric and the median score for each paragraph was taken as the basis of estimating the achievement of the student. The final grade in each reading test consisted of the average of the achievements in each paragraph. The plan used for calculating the degree of achievement was that worked out by Professor E. L. Thorndike and published in the Teachers' College Record for November, 1915. In case, however, a student failed to answer correctly more than two of the five questions in any paragraph 1.0 P. E. was subtracted from the paragraph value, while in case a student answered all the questions bearing on any paragraph correctly, 1.0 P. E. was added to the paragraph value. The first value would be included in the average only in case it lowered it, and the latter value would be included in the average only in case it raised it.

The following table giving the median score and the range of scores or marks in each of the tests indicates the distribution of the groups in the several tests.

TABLE I

Median score and range of scores in theme qualities, reading tests, and Trabue language completion tests for the ninety-eight sophomore students.

TEST	SCORE MEDIAN	RANGE QUARTILE	RANGE TOTAL
Theme "How I earned some money" (A) ..	70	68-75	50-84
Theme "My one extravagance" (B) ..	73	69-77	50-85
Reading Test IA .....	9.1	8.9-9.4	8.3-10.4
Reading Test IA .....	9.1	8.9-9.4	8.3-10.4
Trabue language completion scale L .....	9	7-11	0-15
Trabue language completion scale M .....	11	10-13	3-16

In order to determine the reliability of each test and of the marks for each semester the correlations between each pair of similar tests and each pair of marks were determined. These coefficients of reliability are given in Table II.

TABLE II

Correlations between each two similar tests or each two similar sets of marks.

Sophomore marks, first semester, and sophomore marks second semester .....	$r = + .55 \pm .07$
Rhetoric marks, first semester, and rhetoric marks second semester .....	$r = + .68 \pm .054$
Reading test I scores and reading test IA scores .....	$r = + .40 \pm .084$
Qualities of theme "How I earned some money" and qualities of theme "My one extravagance" .....	$r = + .49 \pm .076$
Trabue language completion scale L scores and Trabue language completion scale M scores .....	$r = + .44 \pm .081$

In Table III are given the coefficients of correlation between the scores of each test or set of marks and the scores of each of the other tests or sets of marks, together with the averages of each four corresponding coefficients and the probable error of the average coefficients.

TABLE III

Correlations between each test or set of marks and each other test or set of marks, and the averages of the four coefficients.

Sophomore marks, 1st semester, and rhetoric marks, 1st semester .....	$r = + .41$
Sophomore marks, 1st semester, and rhetoric marks, 2d semester .....	$r = + .53$
Sophomore marks, 2d semester, and rhetoric marks, 1st semester .....	$r = + .34$

TABLE III.—*Continued*

Sophomore marks, 2d semester, and rhetoric marks, 2d semester.....	$r = +.42$
Average of the four coefficients between sophomore marks and rhetoric marks for one semester.....	$r = +.42 \pm .023$
Sophomore marks, 1st semester, and reading test I scores....	$r = +.26$
Sophomore marks, 1st semester, and reading test IA scores....	$r = +.22$
Sophomore marks, 2d semester, and reading test I scores....	$r = +.29$
Sophomore marks, 2d semester, and reading test IA scores....	$r = +.30$
Average of the four coefficients between sophomore marks for one semester and a reading test.....	$r = +.267 \pm .01$
Sophomore marks, 1st semester, and theme A qualities.....	$r = +.31$
Sophomore marks, 1st semester, and theme B qualities.....	$r = +.27$
Sophomore marks, 2d semester, and theme A qualities.....	$r = +.32$
Sophomore marks, 2d semester, and theme B qualities.....	$r = +.43$
Average of the four coefficients between sophomore marks for one semester and a theme.....	$r = +.333 \pm .02$
Sophomore marks, 1st semester, and completion scale L scores	$r = +.30$
Sophomore marks, 1st semester, and completion scale M scores	$r = +.21$
Sophomore marks, 2d semester, and completion scale L scores.	$r = +.15$
Sophomore marks, 2d semester, and completion scale M scores	$r = +.35$
Average of the four coefficients between sophomore marks for one semester and one completion scale.....	$r = +.252 \pm .026$
Rhetoric marks, 1st semester, and reading test I scores.....	$r = +.16$
Rhetoric marks, 1st semester, and reading test IA scores....	$r = +.19$
Rhetoric marks, 2d semester, and reading test I scores.....	$r = +.26$
Rhetoric marks, 2d semester, and reading test IA scores....	$r = +.18$
Average of the four coefficients between rhetoric marks for one semester and a reading test.....	$r = +.197 \pm .012$
Rhetoric marks, 1st semester, and theme A qualities.....	$r = +.45$
Rhetoric marks, 1st semester, and theme B qualities.....	$r = +.42$
Rhetoric marks, 2d semester, and theme A qualities.....	$r = +.41$
Rhetoric marks, 2d semester, and theme B qualities.....	$r = +.39$
Average of the four coefficients between rhetoric marks for one semester and a theme.....	$r = +.417 \pm .007$
Rhetoric marks, 1st semester, and completion scale L scores.	$r = +.35$
Rhetoric marks, 2d semester, and completion scale L scores...	$r = +.40$
Rhetoric marks, 2d semester, and completion scale M scores...	$r = +.45$
Average of the four coefficients between rhetoric marks for one semester and one completion scale.....	$r = +.380 \pm .017$
Reading test I scores and theme A qualities.....	$r = +.14$
Reading test I scores and theme B qualities.....	$r = +.21$
Reading test IA scores and theme A qualities.....	$r = +.26$
Reading test IA scores and theme B qualities.....	$r = +.08$
Average of the four coefficients between a reading test and a theme.....	$r = +.172 \pm .023$
Reading test I scores and completion scale L scores.....	$r = +.15$
Reading test I scores and completion scale M scores.....	$r = +.19$



TABLE III.—*Continued*

Reading test IA scores and completion scale L scores . . . . .	$r = +.15$
Reading test IA scores and completion scale M scores . . . . .	$r = +.24$
Average of the four coefficients between a reading test and a completion scale . . . . .	$r = +.182 \pm .012$
Theme A qualities and completion scale L scores . . . . .	$r = +.34$
Theme A qualities and completion scale M scores . . . . .	$r = +.30$
Theme B qualities and completion scale L scores . . . . .	$r = +.54$
Theme B qualities and completion scale M scores . . . . .	$r = +.25$
Average of the four coefficients between a theme and a completion scale . . . . .	$r = +.357 \pm .03$

While the probable errors of these correlations are all very small, the coefficients themselves are relatively low. This may be accounted for in part by the close homogeneity of the group of students, all of whom had successfully passed the work of the freshman year. In order to show the effect of increasing the reliability of the tests and of the marks used, the correlations were also found when the scores of each pair of tests were combined into a single set of scores. These coefficients are given in table IV.

TABLE IV

Correlations between tests and marks when either one or both pairs of similar scores or marks are combined.

Sophomore marks, both semesters, and rhetoric marks, both semesters. . . . .	$r = +.40$
Sophomore marks, both semesters, and scores in reading tests I and IA. . . . .	$r = +.35$
Sophomore marks, both semesters, and scores in themes A and B. . . . .	$r = +.37$
Sophomore marks, both semesters, and scores in Trabue language completion tests L and M. . . . .	$r = +.31$
Rhetoric marks, both semesters, and scores in reading tests I and IA. . . . .	$r = +.35$
Rhetoric marks, both semesters, and scores in themes A and B. . . . .	$r = +.57$
Rhetoric marks, both semesters, and scores in Trabue language completion tests L and M. . . . .	$r = +.53$
Scores in reading tests I and IA and scores in themes A and B. . . . .	$r = +.26$
Scores in reading tests I and IA and scores in Trabue language completion tests L and M. . . . .	$r = +.25$
Scores in themes A and B and scores in Trabue language completion tests L and M. . . . .	$r = +.44$
Sophomore marks, 1st semester, and scores in reading tests I and IA. . . . .	$r = +.31$
Sophomore marks, 2d semester, and scores in reading tests I and IA. . . . .	$r = +.42$
Sophomore marks, both semesters, and scores in reading test I. . . . .	$r = +.31$
Sophomore marks, both semesters, and scores in reading test IA. . . . .	$r = +.31$
Sophomore marks, 1st semester, and scores in themes A and B. . . . .	$r = +.33$
Sophomore marks, 2d semester, and scores in themes A and B. . . . .	$r = +.40$
Sophomore marks, both semesters, and scores in theme A. . . . .	$r = +.31$

TABLE IV.—*Continued*

Sophomore marks, both semesters, and scores in theme B.....	r = +.34
Sophomore marks, 1st semester, and scores in Trabue language completion tests L and M.....	r = +.28
Sophomore marks, 2d semester, and scores in Trabue language completion tests L and M.....	r = +.28
Sophomore marks, both semesters, and scores in Trabue language completion test L.....	r = +.28
Sophomore marks, both semesters, and scores in Trabue language completion test M.....	r = +.23
Rhetoric marks, 1st semester, and scores in reading tests I and IA.....	r = +.25
Rhetoric marks, 2d semester, and scores in reading tests I and IA.....	r = +.28
Rhetoric marks, both semesters, and scores in reading test I.....	r = +.27
Rhetoric marks, both semesters, and scores in reading test IA.....	r = +.25
Rhetoric marks, 1st semester, and scores in themes A and B.....	r = +.52
Rhetoric marks, 2d semester, and scores in themes A and B.....	r = +.53
Rhetoric marks, both semesters, and scores in theme A.....	r = +.53
Rhetoric marks, both semesters, and scores in theme B.....	r = +.45
Rhetoric marks, 1st semester, and scores in Trabue language completion tests L and M.....	r = +.40
Rhetoric marks, 2d semester, and scores in Trabue language completion tests L and M.....	r = +.47
Rhetoric marks, both semesters, and scores in Trabue language completion test L.....	r = +.41
Rhetoric marks, both semesters, and scores in Trabue language completion test M.....	r = +.44

It will be noticed at once that increasing the reliability of the tests tends to raise the correlations, also that increasing the number of the academic marks used has about the same effect upon increasing the size of the correlations. There can be no doubt that improving the tests will still further enhance the relationships. The unreliability of the marks as measures of achievement, however, plays just as important a role in keeping the correlations low. To eliminate this tendency as far as possible the raw coefficients of table IV have been corrected for attenuation by the formula:

$$r_{pq} = \frac{\sqrt{r_{p_1q_2}} \times \sqrt{r_{p_2q_1}}}{\sqrt{r_{p_1q_2}} \times \sqrt{r_{p_2q_1}}}$$

In order to get a somewhat more accurate measure of the relationship between the rhetoric marks and the sophomore academic marks than would otherwise be possible, the same formula for making correction for attenuation was applied, even though the pairs of marks are not, strictly speaking, independent measures of the same

abilities. Two possible sources of error are of course present: the validity of the formula for making the correction for attenuation has been questioned by some competent authorities, and the pairs of marks can hardly be strictly accepted as two independent measures of the same abilities. These corrected coefficients are given in table V. Though they may be far from accurate they undoubtedly give a truer account of the relationships than do the raw coefficients.

TABLE V

Coefficients of correlation between abilities involved in making scores in the tests and abilities involved in making marks. Raw coefficients between scores in tests and marks corrected for attenuation.

Abilities to do Trabue language completion tests and abilities to write English compositions.....		$r = +.869$
Abilities to make rhetoric marks and abilities to write English compositions.....		$r = +.719$
Abilities to make rhetoric marks and abilities to make sophomore marks.....		$r = +.688$
Abilities to make rhetoric marks and abilities to do Trabue language completion tests.....		$r = +.685$
Abilities to make sophomore marks and abilities to write English compositions.....		$r = +.557$
Abilities to make sophomore marks and abilities to do reading tests....		$r = +.532$
Abilities to write English compositions and abilities to do reading tests		$r = +.522$
Abilities to make rhetoric marks and abilities to do reading tests....		$r = +.423$
Abilities to do Trabue language completion tests and abilities to do reading tests.....		$r = +.404$
Abilities to do Trabue language completion tests and abilities to make sophomore grades.....		$r = +.430$

Evidently the ability to make rhetoric marks has a closer relation to ability to make sophomore marks than has the ability to write English composition. This may not be assumed, however, to indicate that rhetoric marks are the better basis for predicting sophomore achievement, but may indicate rather that the same irrelevant factors that account for the lack of a high relation between rhetoric marks and composition ability account also for the fact that the relation between the ability to make rhetoric marks and the ability to make sophomore marks is higher than the relation between the ability to write English composition and the ability to make sophomore marks. The possible effect of such irrelevant factors as personal appearance, neatness of work, tactfulness, sociability, good manners, an attractive personality, and even a pleasing voice can work only to lessen the relation between the ability to make marks and the ability to achieve



results. To the extent that such factors do lower this relation they also lower the actual relation that exists between the ability to do certain tests, such as the sentence completion scales or the reading tests, and the ability is measured in terms of academic marks. This suggests that sufficiently reliable measures of language abilities may be considerably better indications of abilities to achieve results in academic subjects than the correlations in the above tables indicate.

It may be somewhat surprising that the ability to do the reading tests has no closer a relation to the ability to make rhetoric marks than is expressed by the Pearsonian coefficient of  $+ .42$ . The very low correlations between the rhetoric marks for either semester and the scores in either reading test are undoubtedly due in part to the unreliability of the rhetoric marks and of the reading tests, as is indicated by the higher correlations when the numbers of the marks and scores of the tests are doubled. The reliability of the reading tests can be readily increased, of course, by improving and lengthening the tests themselves. The low correlation between the abilities, however, is more likely to be due to the fact that mechanical perfection rather than the thought content quality of the theme writing is given the greater weight in the assigning of the rhetoric marks. The higher correlation between the ability to write English composition and the ability to do the reading tests tends to confirm this supposition. Although the relation between the ability to write English composition and the ability to do the reading tests is somewhat higher; namely,  $+ .52$ , yet the relationship is not a close one. The lack of a closer relationship may undoubtedly be accounted for to no small extent by the fact that both abilities are largely influenced by the quality of previous teaching and that largely as a matter of chance would the student who had been wisely taught to read also have been efficiently taught to write English composition, since they are taught not only by different teachers but at different ages and in different types of schools.

In table VI are given the averages of the four coefficients for each two tests and also the correlations between the same two tests when whatever is common to them and to a third test or to a third and a fourth test is eliminated or kept constant. Thus, the relation between the reading test scores for understanding of content and the sophomore marks for one semester is  $+ .267$ , but with whatever is common to these and also to the qualities of English composition eliminated from the relationship, it becomes  $+ .194$ . With whatever is com-

TABLE VI

The averages of the four coefficients for each relation as given in table III and the partial coefficients when a third or a third and a fourth factor are kept constant.

Reading test scores and sophomore marks for one semester.....	$r = +.267$
With what is common to these and a theme kept constant.....	$r = +.194$
With what is common to these and a completion test kept constant..	$r = +.232$
With what is common to these and a theme and a completion test kept constant.....	$r = +.177$
Reading test scores and rhetoric marks for one semester.....	$r = +.197$
With what is common to these and a theme kept constant.....	$r = +.140$
With what is common to these and a completion test kept constant..	$r = +.140$
With what is common to these and a theme and a completion test kept constant.....	$r = +.108$
Theme scores and sophomore marks for one semester.....	$r = +.333$
With what is common to these and a reading test kept constant....	$r = +.302$
With what is common to these and a completion test kept constant..	$r = +.269$
With what is common to these and a reading test and a completion test kept constant.....	$r = +.250$
Theme scores and rhetoric marks for one semester.....	$r = +.417$
With what is common to these and a reading test kept constant....	$r = +.376$
With what is common to these and a completion test kept constant..	$r = +.326$
With what is common to these and a reading test and a completion test kept constant.....	$r = +.291$
Completion test scores and sophomore marks for one semester.....	$r = +.252$
With what is common to these and a reading test kept constant....	$r = +.215$
With what is common to these and a theme kept constant.....	$r = +.151$
With what is common to these and reading test and a theme kept constant.....	$r = +.127$
Completion test scores and rhetoric marks for one semester.....	$r = +.380$
With what is common to these and a reading test kept constant....	$r = +.357$
With what is common to these and reading test and a theme kept constant.....	$r = +.240$
Reading test scores and theme scores.....	$r = +.172$
With what is common to these and the completion test kept constant	$r = +.116$
Reading test scores and completion test scores.....	$r = +.182$
With what is common to these and a theme kept constant.....	$r = +.131$
Completion test scores and theme scores.....	$r = +.357$
With what is common to these and a reading test kept constant....	$r = +.336$

mon. to the reading test scores and the sophomore marks for one semester and also common to the scores of a completion test eliminated, the relationship becomes  $+.232$  instead of  $+.267$ . This, of course, means that while both the reading test scores and the quality of the written compositions are related to the sophomore marks, the latter by  $+.333$ , the overlapping is very small indeed. At the same time the relation between the composition qualities and the sophomore



marks is very slightly lowered when whatever is common to these and to the reading test scores is eliminated from the relationship existing between them. This is just what one would expect from the previous tables.

In case whatever is common to the Trabue language completion scales and also common to the reading test and to the sophomore marks is eliminated, the relation between the reading test scores and the sophomore marks is likewise slightly affected. On the other hand, the relation between the written composition and the sophomore marks— $+ .333$ —drops to  $+ .269$  when whatever is common to these and also the Trabue language completion scale is eliminated. When whatever is common to the Trabue language completion scale and the sophomore marks and also to the written composition is eliminated, the relationship between the Trabue language completion scale and sophomore marks drops from  $+ .252$  to  $+ .151$ .

The six coefficients at the bottom of table VI indicate that elimination of the Trabue language completion scale factor lowers the relationship between the reading test scores and English composition ratings for general merit to a small extent, and the elimination of the English composition element lowers the relationship between the reading test scores and the Trabue language completion test scores likewise to a small extent. The elimination of the reading test element from the relationship of the Trabue language completion test scores and the English composition ratings for general merit lowers the relation hardly at all. When the tests and numbers of marks are doubled the coefficients become higher than for the single tests but the comparative relationships remain unchanged. The last six coefficients of table VII, which give the partial coefficients when the correlations among the abilities are used, show the same tendencies as the last six coefficients of table VI. Evidently, then, it is not what these tests or these abilities have in common that accounts for their relations to sophomore marks or the abilities to make sophomore marks. On the other hand, it is what the theme writing and the sentence completion tests do have in common that largely accounts for their relation to the rhetoric marks; also it is what their abilities have in common that accounts for the relations of these abilities to the ability to make rhetoric marks. As was previously pointed out, however, there are two possible sources of error in the derivation of the coefficients corrected for attenuation yet the corrected coefficient and the partial coefficients derived from them undoubtedly give a much



more accurate notion of the relationships among the abilities involved in the tests and college marks than do the raw coefficients showing relationships between each pair of tests when the correlations between similar tests or similar sets of marks rise above  $+.60$  in only one case out of the five.

From the facts of table VI it is evident that compositions taking not more than half an hour to write, and graded with the Thorndike Extension of the Hillegas Scale by three competent people have just as close a relation to the sophomore marks as do the reading tests for understanding of content taking somewhat longer to give. This probably indicates that the student is judged by the quality of his written work in examinations and in term papers to as great a degree as by his ability to comprehend what he reads. The corrections for attenuation in table VII tend to bear this out. This does not prove, however, that the composition ability is more closely related to ability to make academic marks than is the ability to do the reading tests—table V shows that the two abilities have approximately the same relation to the ability to make sophomore marks—nor does it prove that the ability to read is any less closely related to the ability to achieve results in academic subjects. The facts, however, that the relationship between the composition test and the sophomore marks is disturbed but little by eliminating what is common to these and to the reading test, and that the relationship between the reading test and the sophomore marks is likewise affected only to a small extent by keeping constant whatever is common to these and to the composition test, indicate very clearly that a reading test, and a composition test, or a sentence completion test may well be included in any college entrance examination or in any test designed to classify college students. The partial coefficients given in table VII substantiate the advisability of doing this.

In regard to the work in English three further observations seem warranted by the evidence presented in the above tables: first, for classification students in rhetoric, either a composition test or an extensive sentence completion test seems to offer a reasonable basis; second, for classifying students in classes for the study of literature the reading test may undoubtedly be expected to give a considerably better basis than either the composition test or the sentence completion test; third, in view of the differences in the abilities involved in reading for thought content and in writing ac-

ceptable composition, it seems highly inadvisable to give a single mark for both subjects, calling it a mark in English, as is the common practice in secondary schools.

The results given in table VII substantiate the inferences drawn from the facts of table VI. The abilities involved in composition

TABLE VII

Correlations and partial correlations among abilities involved in the language tests and college marks. Raw coefficients corrected for attenuation.

Reading abilities and abilities involved in making sophomore marks...	$r = +.532$
With what is common to these and composition abilities kept constant.....	$r = +.338$
With what is common to these and completion test abilities kept constant.....	$r = +.462$
Reading abilities and abilities involved in making rhetoric marks.....	$r = +.423$
With what is common to these and composition abilities kept constant.....	$r = +.080$
With what is common to these and completion test abilities kept constant.....	$r = +.219$
Composition abilities and abilities involved in making sophomore marks.....	$r = +.557$
With what is common to these and reading abilities kept constant...	$r = +.383$
With what is common to these and completion test abilities kept constant.....	$r = +.563$
Composition abilities and abilities involved in making rhetoric marks.	$r = +.719$
With what is common to these and reading abilities kept constant...	$r = +.640$
With what is common to these and completion tests abilities kept constant.....	$r = +.344$
Completion test abilities and abilities involved in making sophomore marks.....	$r = +.340$
With what is common to these and composition abilities kept constant.....	$r = +.350$
With what is common to these and reading abilities kept constant...	$r = +.161$
Completion test abilities and abilities involved in making rhetoric marks.....	$r = +.685$
With what is common to these and composition abilities kept constant.....	$r = +.685$
With what is common to these and reading abilities kept constant...	$r = +.620$
Reading abilities and composition abilities.....	$r = +.522$
With what is common to these and completion test abilities kept constant.....	$r = +.377$
Completion test abilities and composition abilities.....	$r = +.869$
With what is common to these and reading abilities kept constant...	$r = +.869$
Completion test abilities and reading abilities.....	$r = +.404$
With what is common to these and composition abilities kept constant.....	$r = +.117$

writing account in part for the relation—+.53—between the abilities involved in making sophomore marks and those involved in reading for content. At the same time the abilities involved in composition writing account very largely for the relation—+.42—between the abilities involved in making freshman rhetoric marks and those involved in reading for content. The reading test, then, has a distinct relation to college marks in general apart from either the student's ability to write compositions or to fill in the blanks in a completion test. On the other hand, it seems to have a less close relation to the abilities involved in the study of rhetoric insofar as that study functions in improved ability to write compositions. This conclusion is further substantiated by the correlations showing that the abilities involved in reading have but little in common with the abilities involved in composition writing and those involved in making marks in rhetoric. They reduce the correlation only from +.719 to +.64. Furthermore, the relation between the abilities involved in making rhetoric marks and those involved in filling in the blanks in a completion test is reduced only from +.685 to +.62 when the abilities involved in reading for content are eliminated from the relationship. Such a condition presupposes a very close relation between the abilities involved in filling in the blanks in a completion test and those involved in composition writing and also that this relationship should be accountable for only to a small degree by the abilities common to these and also to reading for content. That this is exactly the condition is indicated by the correlation between the abilities involved in composition writing and those involved in filling in completion test blanks—a correlation which is reduced from +.869 only to +.837 when whatever is common to these abilities and also to the abilities involved in reading for content is eliminated.

In table VIII are given the raw coefficients, and also the partial coefficients when certain factors are kept constant, between the rhetoric marks for one semester of the freshman year and the sophomore academic marks for one semester, and also between the averages of the rhetoric marks for the two semesters and the sophomore academic marks for the two semesters.

The striking fact about this table is not the comparatively low correlations between the rhetoric marks and the sophomore marks for one semester or for two semesters, even though one would expect them to be somewhat higher, inasmuch as the sophomore marks are



TABLE VIII

Relations of rhetoric marks to sophomore academic marks.

Rhetoric marks, one semester, and sophomore marks, one semester....	$r = +.425$
With what is common to these and the composition test kept constant.....	$r = +.333$
With what is common to these and the reading test kept constant....	$r = +.395$
With what is common to these and the Trabue language completion test kept constant.....	$r = +.368$
With what is common to these and the composition test and the reading test kept constant.....	$r = +.319$
With what is common to these and the composition test, the reading test, and the Trabue language completion test kept constant....	$r = +.300$
Rhetoric marks, two semesters, and sophomore marks, two semesters..	$r = +.400$
With what is common to these and the composition tests kept constant.....	$r = +.249$
With what is common to these and the reading tests kept constant..	$r = +.325$
With what is common to these and the Trabue language completion tests kept constant.....	$r = +.296$
With what is common to these and the composition tests and the reading tests kept constant.....	$r = +.200$
With what is common to these and the composition tests, the reading tests, and the Trabue language completion tests kept constant.....	$r = +.170$

in no small measure based upon the composition ability of the students, but the small amount by which these correlations are reduced when whatever is common to these and to the composition test, or to the reading test, or to the Trabue language completion scale, or even to all three is eliminated. That so small a proportion of the relationship between the rhetoric marks and the sophomore marks can be accounted for on the basis of the composition ability of the students and that a still smaller proportion can be accounted for on the basis of reading for thought content is truly astonishing. Surely other factors besides academic achievement must enter into the assignment of academic marks, inaccurate subjective estimations undoubtedly being one of the more important ones. Since this seems to be the case, we cannot expect any approximately exact measure of achievement in composition writing, as far as general merit is concerned, to show a high correlation with the marks made in rhetoric, nor are we likely to find any tests for making anywhere nearly as accurate a prediction as to what marks a student will make in rhetoric as we can as to what degree of achievement he has attained in ability to write English composition, or is likely to attain in it under similar conditions of tuition.

The conditions pointed out with respect to rhetoric, however, must not be understood to be characteristic of rhetoric alone. The fact that more adequate means for making more accurate measurements have been developed in this field has made possible the analysis of these conditions in this particular subject. That just as large discrepancies may be expected to exist between academic marks and academic achievements in other subjects is evidenced by the low correlation between the sophomore marks of the first semester and those of the second semester of the same year.

# THE EFFECT OF RATE OF SILENT READING ON ABILITY TO RECALL

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[NOTE.—The data for this article was collected by J. M. Frost and J. A. Russell, students in a course in Experimental Education at Dartmouth College.]

The relationship of speed and comprehension in reading has received theoretical consideration by many writers. Romanes,<sup>1</sup> Abell,<sup>2</sup> and Quantz<sup>3</sup> have studied the relative ability of rapid and slow readers to recall what they have read. Romanes found that the most rapid readers were best in reproducing what they had read. Abell found that the same two subjects headed the list for both speed of reading and ability to recall. Quantz found that his rapid readers were on the average about 37% superior to the slow subjects in the quality of their work. The fast readers were more exact in reproduction and did not introduce so many extraneous ideas in their reports. Judd<sup>4</sup> and Gray<sup>5</sup> found about twice as many rapid readers with good quality scores as with poor scores.

But these investigators have compared one type of individual, the rapid reader, with another type of individual, the slow reader. The further problem arises as to whether an increase in the rate of reading of a particular reader will result in a loss in ability to recall what has been read; whether a reader can speed up his reading rate without lowering his capacity to reproduce what he has read. It is the purpose of this article to report a study of the effect of different speeds of silent reading upon ability to recall what has been read.

Two sets of six paragraphs each were chosen for the experiment. One set was for use with high school and college students and the other set for use with the fourth and seventh grades. The paragraphs in a set were relatively equal in difficulty but differed widely in content. Each paragraph was composed of ten distinct ideas and contained fifty words. A few paragraphs chosen from each of the two sets are given below. Each paragraph was printed on a separate card for use by the readers.

## SAMPLE PARAGRAPHS FROM THE SET USED WITH THE FOURTH AND SEVENTH GRADES

1. The Amazon is the longest river in the world. It drains most of the northern half of South America. Its mouth is along the equa-



tor. The rubber tree grows in this valley and the few people that live there spend most of their time making gum.

2. Abraham Lincoln was born in Kentucky in the year eighteen hundred and nine. His father was too lazy to work and his mother had to make a living for the family. After she died Abraham had to do for himself. But he was one of those boys who made good.

3. One day a deer was feeding on top of a hill. A little fawn was with her. Its brown coat was marked by spots. Its father had gone for a trip across the hills and had not yet got back. He went to feed on the lily leaves there.

SAMPLE PARAGRAPHS FROM THE SET USED WITH HIGH SCHOOL AND COLLEGE STUDENTS

4. In person William of Orange was above middle height. His eyes and complexion were brown. His head was small portraying the alertness of a soldier. He was more than anything else religious. He went through life bearing the people's sorrows upon his shoulders with a smiling face.

5. One morning a doe was feeding on Basin Mountain. Her sole companion was a little fawn whose brown coat was beginning to be mottled with beautiful spots. Its father had been on a long tramp across the mountain and had not yet returned. He went to feed on the lily pads there.

6. There are eight thousand volumes in the Imperial library at Paris. If a man were to read from dawn till dark for sixty years he would die in the first alcove. But if a man could know a few great books and read them he would become well read.

Three different speeds of reading were used by each subject, his normal rate, his maximum speed as controlled by the knowledge that he would be called upon to reproduce what he had read, and "at about half normal speed." As a rule this last speed was not actually nearly so slow as the subject was directed to read but it was definitely slower than his normal rate. As soon as a paragraph was read the subject immediately wrote down everything he could remember. The subject was told that he need not use the exact words of the text but to try to reproduce all the ideas he could remember.

In order to eliminate the effect of any difference in difficulty of the paragraphs and any effect of the order of reading the paragraphs, the subject read them in the order denoted by the following table, that

is, the first subject read paragraph no. 1 first at his normal rate; paragraph no. 2 just as rapidly as possible; paragraph no. 3 slowly; paragraph no. 4 at normal rate; paragraph no. 5 slowly and paragraph no. 6 rapidly. Subject no. 2 read paragraph no. 2 first at normal rate; paragraph no. 3 slowly; paragraph 4 rapidly; paragraph 5 at normal rate; paragraph 6 rapidly and paragraph 1 slowly. Subject no. 3 read paragraph 3 first at normal rate and the others in the order indicated.

Sub- ject	Nor- mal	Rapid	Slow	Rapid	Sub- ject	Nor- mal	Rapid	Slow	Rapid
1	1	2	3	..	5	5	6	1	
	4	..	5	6	..	2	3	..	4
2	2	..	3	4	6	6	..	1	2
	5	6	1	..	..	3	4	5	
3	3	4	5	..	7 same as 1; 8 same as 2, etc.				
	6	..	1	2	The numbers under heading Normal,				
4	4	..	5	6	Rapid, Slow, Rapid refer to paragraph				
	1	2	3	..	numbers, and indicate order of reading.				

The experiment was given to 50 college students, 25 high school students, 27 seventh grade pupils, and 23 fourth grade pupils.

As each subject read two paragraphs at his normal rate, two rapidly, and two slowly, the two reading times for each rate were added together giving the time in seconds for reading one hundred words. The sum of the number of ideas reproduced for each rate of reading gave the comprehension score for the three rates of reading for each subject.

Table I gives the average rate for normal, fast, and slow reading for each group tested. As two different sets of paragraphs were used no comparisons can be made between the rates for the fourth and seventh grades with the high school and college students.

TABLE I  
Rate of reading

	Fourth	Seventh	High school	College
Slow.....	61.6	47.4	53.3	36.6
Normal.....	45.0	38.7	33.6	25.7
Fast.....	37.4	37.6	25.3	17.2

Table II gives the average comprehension scores for normal, fast, and slow reading for each grade tested.

TABLE II  
Comprehension scores

	Fourth	Seventh	High school	College
Slow.....	8.3	11.1	10.5	10.6
Normal.....	8.25	10.3	8.56	10.7
Fast.....	9.57	11.04	8.54	9.75

In order to get some equitable basis for comparing these results, speed and accuracy were combined into a single score by dividing the comprehension score by the rate of reading expressed in seconds per hundred words. This gave the number of ideas gained per second. For example, if the subject required 30 seconds to read two paragraphs at the normal rate and reproduced 15 ideas, he gained .5 ideas per second in his reading. Table III gives the ideas per second for slow, normal, and fast reading for each of the four groups of subjects.

TABLE III  
Ideas gained per second

	Fourth	Seventh	High school	College
Slow.....	.134	.234	.195	.242
Normal.....	.183	.266	.251	.416
Fast.....	.256	.293	.329	.566

The rate, comprehension score, and the number of ideas gained per second are presented in the accompanying graphs.

In general the rate of reading, when the subjects were instructed to read very slowly was about 40 per cent slower than their normal rate. This variation in rate was fairly constant for each of the four groups of subjects. The time required for reading rapidly was about 16 per cent less than the normal reading time. This difference was fairly uniform for the different groups except for the seventh grade. The seventh grade read only a very little faster in their rapid reading than in their normal reading.



In comprehension there was very little difference for any of the groups resulting from the different rates of reading. If there was any advantage it seemed that it was in favor of the rapid reading with the children and in favor of slow reading for the older students. But in general the readers seemed to get about the same number of ideas whether they read fast, slow, or at their normal rate. This fact is shown in the accompanying graph.

When we take into consideration the time required to read the paragraphs in relation to the amount of material gained from the reading we begin to see the great advantage of rapid reading over slow or even normal reading. There were 20 per cent fewer ideas gained per second in slow reading than in reading at the normal rate and 26 per cent more ideas gained per second in rapid reading than in reading at the normal rate. This superiority of rapid reading is shown by each of the four groups of subjects tested.

Other investigators have pointed out that in general the most rapid readers of a group are best able to reproduce what they have read. Huey<sup>6</sup> describes a personal experiment in which he was able to increase his reading rate nearly a half during a short period of practice. While no doubt there are limits in speed beyond which we should not go, there seems little doubt but that almost any of us could materially increase our reading rate without perceptibly reducing the per cent of the ideas which we could reproduce. If this be true the teacher of reading by insistence upon accurate, rapid, silent reading would be able to reduce not only the time required by pupils in the schools in the preparation of their lessons but also and more important still greatly increase their efficiency in life.

The objection that the subject matter of this experiment was too easy might be raised. The material was easy for the seventh grade pupils and the college students but it was difficult for the fourth grade children and the high school students. The same general results were shown for all four groups. The material may not have been as difficult as advanced science, philosophy, or economics. But even with these subjects, it seems probable that slow reading is a wasteful process. Most of us could increase our rate of reading history, literature, and much descriptive science, as well as our general reading in newspapers and magazines, without loss in retaining what we have read. Another objection that the paragraphs were too brief might be raised. We cannot be sure that the same laws will hold with a paragraph containing a small number of distinct ideas and a longer

selection more or less vague in character. Furthermore delayed recall might not give as much advantage to rapid reading as immediate recall. These problems need further experimental study. But there seems to be no reason to expect the results to differ from those of the present study.

It is not our purpose to enter into a discussion of the question as to whether slow reading tends to focus the attention upon the individual words rather than upon sentence and paragraph meanings, or whether slow reading tends to be accompanied by too much gross movement of the vocal cords which acts as a distracting influence. It may be that there is a heightened muscular or nervous tonus in rapid reading which makes for greater efficiency. Suffice it to say that at least with short paragraphs of ordinary material rapid reading is decidedly more economical than either slow or normal reading.

#### REFERENCES

1. Romanes, "Mental Evolution in Animals," p. 136.
2. Abell, A. M. "Educational Review," October, 1894.
3. Quantz, J. O. "Psychological Review Monograph Supplements," Vol. II., No. 1 (December, 1897).
4. Judd, C. H. Measuring the Work of the Public Schools. *Cleveland Survey Monograph*.
5. Gray, W. S. "Studies of Elementary School Reading Through Standardized Tests," p. 136.
6. Huey, E. B. "Psychology and Pedagogy of Reading," p. 178.

## A CORRECTION

Through some mischance, proof of the paper in the February issue of the Journal, describing "A Brief Group Scale of Intelligence for use in School Surveys" never reached the author. As a result, certain errors appeared—errors which were for the most part unimportant, or obvious, but which should nevertheless be corrected, for the benefit of those using the scale. On the first page of the paper (p. 89), in connection with the intention there stated of using special devices for making possible "a ready interpretation of results in terms of school practice," there should have been reference to a *Communication* in the December number of the Journal, entitled "Suggestions with regard to Professor Thurstone's 'Method of Critical Scores.'" These special methods were presented in this communication, with data regarding the Cross-Out scale.

On page 97 Brown's formula was given incorrectly; the formula reads:  $r_2 = \frac{2r_1}{1 + r_1}$ .

On page 99 the equals and plus signs were omitted from the statement of third order partial correlation coefficients, and regression equations. The third order correlation coefficients run as follows:

$$r_{12.345} = .15 \quad r_{13.245} = .25 \quad r_{14.235} = .28 \quad r_{15.234} = .37$$

The regression equation should read:

$$x_1 = .1048x_2 + .1515x_3 + .1979x_4 + .2218x_5$$

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## A STUDY OF CERTAIN RECREATIONAL READING AND<sup>1</sup> VOCATIONAL PHASES IN THE LIVES OF YOUNG GIRLS

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Not a day passes but thousands of people in this country are faced with questions vital to them regarding the best disposition of their time. From the older men and women who are greeted with new opportunities for leisure and its pleasures, to the boys and girls who are planning their life work, situations are arising which demand insight into human likes and dislikes, resources and adaptabilities. Particularly for our youth is it necessary to obtain all the suggestions and information possible regarding these personal factors.

The interests of school children have frequently been the subject matter of studies by those working in educational and vocational fields. Suggestions have been sought from this source in the effort to solve some of the vexing problems which arise inevitably a few years later in the lives of the young people. How will each individual fit into his environment, how develop resources within himself through which he can satisfy his social needs and how find an occupation in which he will prove an asset to his community? The mal-adjustments that occur during these processes are only too well known.

The difficulties encountered in a pronounced instance of this sort were responsible for the present study. The case was one of an adolescent girl who, failing to understand herself, was quite unsuccessful in organizing her capacities or in gaining any guiding motive in her life. She was disturbed by conflicting personal inclinations and these, mingled with an atmosphere of social artificiality with

<sup>1</sup>The author wishes to acknowledge with sincere gratitude the suggestions and encouragement received from Dr. Adolf Myer of The Phipps Psychiatric Clinic, John Hopkins Hospital and from Dr. Wm. Burdick of The Public Athletic League of Baltimore, Maryland.

which she was surrounded, left her bewildered. This distressing set of circumstances made her totally self-engrossed and resulted in an impossible mental attitude and an inefficient life. She drifted into an existence where the longing for excitement and superficial amusements formed the basis of her recreational activities. Serious thought regarding plans for the future was completely lacking. The nearest approach to such a consideration was the vague and perilous occupation of day-dreaming. There were other pathological factors in this girl's case which do not ordinarily occur, but the characteristics given above typify remarkably well, though in somewhat exaggerated form, certain dangerous tendencies which arise in the lives of most normal individuals. Much study is required to supply a thorough insight into the many needs of children. It is only with the help of detailed analysis that broad educational plans can be built up which will successfully develop individual trends and qualifications, and reduce the occurrence of disasters from the unfortunate tendencies which beset most individuals.

As a further illustration of the application of the present study, another instance may be cited. This is the familiar story of a young person who, on starting to work, takes the first job that offers. After a relatively short trial at this occupation, discontent and discouragement becomes so strong that he shifts to some new field. This is repeated over and over again, often within a single year. To argue that there is an element of educational benefit for the worker in this process is a perversion of reason, and the pecuniary loss to him as a result of wasted time is as excessive a burden as is the loss to his employers from wasted training expenses. In the latter case the cost exceeds any tax that might be justly placed upon the employer in default of more ideal educational methods than exist in most places today. An even less favorable verdict may be brought against this situation when viewed from the standpoint of character formation. Opportunities are practically absent for the development of such essential qualities as reliability and perseverance.

There is an immense amount of adjustment to be affected on the industrial side to meet these problems and this is becoming recognized. However, there is still need for further study and analysis of the individual and the social group, and the author, in a small way, has made an effort to furnish suggestions for attacking the problem from that angle.

The opportunity to undertake the study came through the Public



Athletic League of Baltimore during the winter of 1917-18. In the course of physical examinations made on prospective participants in the League's school activities, eight hundred girls ranging in age from six to twenty years, were informally interviewed on the following subjects; recreational interests, reading tastes, and future vocational preferences. A critical survey of the material thus gathered shows that care must be exercised in its portrayal. The talks with the girls were necessarily short, and while probably few intentionally misleading statements were made, nevertheless other possible sources of error must be taken into account. In some cases the children may have tried to "show off," or to say what they thought was expected of them. The informality of the interviews, however, and the spontaneous interest and response on the part of the girls would lead one to believe that this was not true in many cases. On the other hand, such factors as the latest fads and interests of the moment undoubtedly played a large part in determining the nature of the answers. However, as these transitory interests are a well recognized part of the makeup of most young people, and as the changing "crazes" and "rages" and "stunts" are in so many instances prompted by real developmental needs, they must be considered.

An attempt to form group correlations between the type of personality and the various interests proved futile. Whether it would have been successful with a more intensive plan of study could not, of course, be determined. The final analysis of these conversations, while not forming rigidly scientific informational material, does give insight into the child's point of view. In addition to this it emphasizes certain neglected obligations along social and educational lines. Educators are beginning to realize that these factors must be seriously taken into account.

The subject matter of the study could not be arranged in groups of the same size, but a convenient assembling according to age was made as follows: Group I, girls from six to ten years, numbering approximately one hundred; Group II, eleven to twelve years, one hundred and eighty girls; Group III, thirteen to fourteen years, two hundred and twenty-five girls; Group IV, fifteen to sixteen years, one hundred and fifty girls; Group V, seventeen to twenty years, one hundred and fifteen girls, (See Diagrams 1, 2 and 3).

A word of explanation should be given here with regard to the study made of the books chosen by the girls, and particularly with regard to that portion of the study in Diagram 2, (Reading Subjects).



Diagram 1. Recreational Subjects.

GROUP I. 6-10 yrs. No. 100.	Very active Play and Games.	Reading	Parlor Games	Make Beliefs
GROUP II. 11-12 yrs. No. 180.	" " " " " Outdoor Sports.	Sewing	Reading	Parlor Games Miscellaneous
GROUP III. 13-14 yrs. No. 225.	Active Games and Outdoor Athletics.	Sewing	Reading	Misc.
GROUP IV. 15-16 yrs. No. 150.	" " " " "	Sewing	Reading	Dancing Misc.
GROUP V. 17-21 yrs. No. 115.	" " " " "	Sewing	Dancing	Miscellaneous

Diagram 2. Reading Subjects.

GROUP I. 6-8 yrs.	General.	Nursery Rhymes.	Fairy Tales.	
8-10 yrs.	General.	Fairy Tales.		Girls Stories and Series.
GROUP II. 11-12 yrs.	General.	Boys Books.		Girls Stories and Series.
GROUP III. 13-14 yrs.	General.	Adventure	Boys Books.	Girls Stories and Series.
GROUP IV. 15-16 yrs.	General.	Adventure.	Boys Books.	Girls Stories and Series.
GROUP V. 17-21 yrs.	General.	Adventure and Romantic Appeal.		

Diagram 3. Vocational Subjects.

GROUP I. 6-10 yrs.	Teaching.	Home Occupations. Cooking - Housework Dressmaking - Sewing Having a Family.	Nursing	Misc.	No Choice.
GROUP II. 11-12 yrs.	Teaching.	Stenography.	Nursing.	Misc.	No Choice.
GROUP III. 13-14 yrs.	Teaching.	Stenography.	Nursing.	Misc.	
GROUP IV. 15-16 yrs.	Teaching.	Stenography.	Nursing.	Misc.	
GROUP V. 17-21 yrs.	Teaching.	Stenography.	Nursing.	Misc.	

It must be understood that the grouping in the diagram is in no sense based on what could be called either a literary or a library classification of the books. The attempt was made, rather to determine wherein lay the main psychological appeal to the child and to make this the basis of arrangement. The method could not be followed through in a very exact way as the indefiniteness of many of the headings of the diagram indicates. This same idea, however, is taken up in the text where certain factors are commented on. With the material and facilities at hand only a beginning toward a thorough analysis could be achieved and it is hoped this will be held clearly in mind in connection with all the book material throughout the ensuing pages. In making up the book lists the scheme adopted was to place a book in that age group where it was chosen as favorite the largest proportionate number of times. In addition to this, its complete range among the different ages is given. As entire freedom was encouraged in the answers and as a number of the girls preferred to give authors or general types of books rather than specific titles, these were recorded and arranged in the same way as the individual books and were placed at the ends of the book lists. Where the authorship of books was difficult to obtain or to verify, the matter was not followed through, owing to limited time. The author wishes to acknowledge with most sincere thanks the help given through Dr. Bernard Steiner of the Enoch-Pratt Library of Baltimore in supplying the names of authors and correcting errors in the book lists.

Group I. Six-ten years, One hundred girls.

In regard to pastimes, two-thirds of these children prefer very active play to amusement of any other sort. "Catchers" "Spy," the various form of Tag and Ring games are the favorites. Of the other one-third, the choice is pretty well divided: One-ninth preferring such make-believe games as playing school, keeping house, and "Baby Dolls" with another ninth of those choosing to read or to be read to, and a similar proportion indulging in simple card and parlor games.

This distribution corresponds characteristically to the way in which numbers of little girls of about these ages spend their time, the largest part of it very actively, many of the remaining hours busy with absorbing make-believes, with shorter intervals occupied with the type of games which later in life become much more popular diversions.

Turning to the reading and "story" interests, a definite division is apparent between the children from six to eight and those from nine to ten years. With the younger group, the fairy tales comprise more



than two-thirds of the selections and are nearly twice as popular as with the latter group. A few of the younger children have mentioned nursery rhymes. This choice is not made by any of the older ones. The books and stories cited by the children are listed in Table 1. It may be noted that among the older children's books appear for the first time those girls' stories and serials which become so markedly popular with somewhat older children. Only four of the little girls gave Bible stories as their favorites; three, the story of the "Baby Jesus" and one, "Daniel in the Lion's Den." One little girl of eight spoke with excited interest, of the story of Roland. Three noteworthy books, of varied nature, selected by the older girls are, "Uncle Tom's Cabin" with its pathos and sentimental appeal, the animal story of "Beautiful Joe" and the absorbing tales of "Uncle Remus." Doubtless school reading is reflected in this list as in the other, but no attempt was made to determine the exact extent of this influence.

The choice of future occupation of the young group of children shows several factors operable in their lives. The largest proportion (slightly over one-third) named teaching as their favorite profession. This certainly reflects the strong and well known influence of the early grade teacher—perhaps the first outside influence that comes into the child's life. Next in popularity to that of teacher, are the various home callings, one-sixth of the group, or slightly less than one-half of the former number, choosing these. In this division are included such occupations as housework, cooking, dressmaking, sewing and last but not least, that of having "a family and babies." The answers given by the children of this youngest group show two characteristics not found among the older girls. In the first place, as might be expected, there are very appealing and naive answers evincing early admirations. One wishes to be "a lady and do housework;" another to be "a lady and wash dishes," or "a lady and set the table," or the same and "do house-cleaning." The fact of "being a lady" above all else seems to take hold of their minds. The second characteristic is the frankness with which a little girl says she wants "to have a little child" or "be a mother," this rarely occurring in the replies of the older girls.

The remaining preferences are divided into three nearly equal shares of slightly over one-seventh each—those wishing to be nurses, those choosing miscellaneous occupations and those not knowing what they would like to do. In the second group are found the professions of actress, musician, author, artist, and one representative each for store-keeper, typist, and telephone operator.



Group II, made up of one hundred eighty girls from eleven to twelve shows about the same proportion of preference for active games. "Out door sports" figure largely, and in addition to these games (similar to those named by the preceding children), others requiring more skill make their appearance, including various group ball-games, swimming, skating and horseback riding, all of these having advocates. A few of the girls voiced unusual preferences such as "games at night" where the element of darkness lends excitement; also "Indian games," and "setting up a tent in the woods;" this latter, doubtless reflecting opportunities granted only to special ones of this group, shows the eager imagination, natural to most children, which grasps at such forms of recreation. One of the girls in this group whose acme of bliss is contained in a single yearly trip to a shore amusement park enlists our sympathy but she is not so much to be pitied as another child who found her chief joy in "loafing," plain and simple; just sitting around doing nothing appeals to her more than anything else. To better this attitude, which later may develop into a real loss of ambition and laziness, as seen in the wife of many a well-to-do merchant or mechanic, the most intelligent methods must be employed. Sometimes medical skill discovers a physical condition at the basis of this boredom. One form of diversion which appears fairly frequently is sewing or crocheting. Among the children of this age the desire to "play mothers" is given once; this marks the oldest child who refers directly to the maternal instinct. Among these girls, the card and parlor games take less than half as prominent a part as they do in the preceding group. Reading as a pastime was chosen by one-sixth of the children of this group, a proportion about twice as great as in the previous group.

In a miscellaneous group of one-sixth, several forms of music (singing and piano) drawing and dancing are chosen and a few activities such as the movies, the theatre and shopping have individual adherents.

Among the books chosen by the girls of this group, Fairy Tales have markedly dwindled. Girls' stories and series cover nearly one-half the entire choice. Boy's books form a conspicuous group. Among the different groups of books included in the large general groups several animal and nature tales may be noted. Another book found here is "Little Lord Fauntleroy" whose fascination undoubtedly exists for many of its readers in a delightful absence of any of the disagreeable incidents that mar the normal course of ordinary

life. Moreover, further charm is present in the narrative by a veritable wish fulfillment scheme of affairs which magnifies the importance of the central figure of the little lord, so luckily and luxuriously situated in every respect. The movements and plans of other people revolve with regard to his pleasure and as far as clothes and play-things are concerned, nothing is too good for him.

The fantastic and compelling conception of "Alice in Wonderland" has its place with the children of these years. Certain of their remarks made in connection with it suggested that a leading factor in its attraction for the youngsters lay in the strange appearance of the personalities encountered in the story. This presents quite a contrast to what forms such a strong appeal to older readers, *i.e.*, the queer turns that events take and the freak episodes present in the tale. For the children the action represents mere necessary framework for the story, a thread connecting more interesting features. It does not serve as with older readers in bringing up vague memory drifts or in calling into clearer consciousness, undercurrent tendencies of thought and action, ordinarily concealed by conventions and rationalization.

As to favorite professions these girls may be divided into five classes: teaching, stenography and miscellaneous vocations claimed approximately one-fourth each; one-sixth thought they would like to be nurses and one-twelfth had no particular inclination at that time. It should be noted that with these girls, as with the succeeding groups, the three main professions are those of teacher, stenographer and nurse. The miscellaneous list of vocations includes a fairly large range—dressmaker, milliner, housekeeper, saleslady, doctor, telephone operator and artist. The foregoing comprises those occupations having a plural vote, while other occupations, mentioned singly, are: notary public, secret service worker, designer, landscape gardener, actress, singer, chemist, violinist and author.

Of the thirteen and fourteen year old girls (Group III, two hundred twenty five individuals) slightly more than half preferred active games to other forms of amusement. The games chosen were predominantly those that would be classified as athletics rather than as simple children's games; among the favorites are swimming, gymnastics, ball-games and skating. Dancing also shows a small increase in popularity over the minor place it held in the interests of the preceding group.

Considerably less than one-fourth professed to enjoy various



forms of sewing above other things while just a little less than one-fourth of the girls showed a preference for reading. The remaining girls gave cultural activities as their favorites—music, singing, drawing, with a half dozen obtaining greatest enjoyment from the movies.

Of the books chosen, nearly one-half are girls' series. In addition to the large general group, tales of adventure and boys' books hold a conspicuous place. Among the former are Indian tales, western stories, tales of the sea, Robin Hood, Robinson Crusoe and several books by Robert Louis Stevenson and Sir Walter Scott. The appeal of sentimental novels and stories seems to have increased considerably. Several girls mentioned biography and history as being their favorite reading. Other choices indicating increasingly widening interests are such as Red Cross Books, newspaper stories, moving picture plots, animal and jungle stories, and tales of pathos.

The choice of vocations falls into four divisions—the three chief ones being teaching which approximates one-fourth, nursing, one-fifth, and stenography one-third. Among those choosing the first mentioned numbers of variations exist, ranging through the different types of music teachers, dancing teachers, teachers of domestic sciences, and teachers of the more usual academic subjects. A heterogeneous division includes many different professions and trades—doctor, lawyer, business callings, sales person, dressmaking, artistic, musical and literary vocations and telephone operating, with a comparatively large number who are uncertain of what line to follow.

Of the fifteen and sixteen year old girls (Group IV, one hundred fifty girls) slightly over half chose outdoor athletics of various sorts, one-sixth professed to enjoy dancing most, with somewhat less than that number, about one-eighth choosing reading, and two still smaller groups (one-twelfth each) naming sewing and knitting, and a miscellaneous set of amusements, including certain outside interests such as the movies and "the theatre at night." The dancing that appears in this group shows the first strong trend toward social dancing that could be differentiated from that of the gymnasium or dancing school.

Of the books named, about one-third are girls' series. An increasingly popular type of books with these girls are tales of adventure and romance, and boys' stories rank noticeably high in favor. The kind of fiction which has a sentimental turn is also favorably regarded.

The chief professions named are the familiar three, the division being approximately, stenography one-third, teaching one-fourth, and nursing one-sixth, with the remaining numbers (group of one-



fourth) showing a range of choice—dressmaking, millinery, selling profession, various forms of pure and applied art, and that of author, and doctor. It may be noted that social service work and playground work are represented and even the missionary field has one devotee.

The last number of girls (Group V, one hundred fifteen girls) include those from seventeen to twenty-one years, only a few of the older years being represented. The distribution of recreational interests followed the preceding groups fairly closely except that very few care for reading, and the balance of choice swings to sewing; about one-half gave outdoor athletics, while with the remaining half the choice was pretty evenly divided into thirds among which were dancing, sewing and a miscellaneous assortment, including movies, art, music and reading.

In the books chosen by these girls those full of adventure and romantic experiences, take the chief place (nearly one-half); a small proportion mentioned such classics as Shakespeare, Victor Hugo and Elliott; while a few others chose animal stories, character sketches, love story novels with several devotees for more sentimental tales.

Among the chosen professions almost one-half gave stenography, this large proportion probably due in part to the fact that a number of the girls come from one school where the course in this was emphasized along with a patriotic appeal to supply the acute government need for the work which existed at that time. After this profession, teaching and nursing rank about the same in popularity (nearly one-fourth each) with only a most scanty representation for other professions—artists, librarians, saleswomen and home keepers.

In order to facilitate general discussion and comparison, the foregoing material has been presented in charted form given in Diagrams 1, 2 and 3. Many features already discussed in connection with age and subject groups will receive no further comment.

The recreational diagram shows conspicuously the popularity of active games and sports so common with most young people. Throughout the entire age range they constitute at least half the total number of preferences, and with the girls under thirteen years, considerably more than that. Reading reaches its maximum of popularity (about one-fifth) with the thirteen and fourteen year old girls, and at that age also sewing and various forms of needle work first appear to attract. The instruction in this, furnished by several of the large de-

partment stores, was mentioned in several instances. The situation there seems to be satisfactory so far as the trade is concerned, but the stores with their ostentatious displays and furnishings are exploiting in their own interests an instinct which it should be the duty of the school to develop. As it is, the instinct to decorate is betrayed by an appeal made to questionable taste with showy, flimsy, perishable and oftentimes very expensive goods; whereas it should receive careful consideration in our schools and become an acknowledged part of the child's planning with regard to home and personal equipment of every sort. Then, from our girls as the result of intelligent admiration, we might expect to have a demand for honest worth in materials and see really artistic designs and models in house furnishing as well as in dress instead of the tawdry effects which most of our young girls seem to be striving for. Dancing apparently first assumes importance socially as a real pastime at about the age of fifteen years. This is contrasted with gymnasium and exercise dancing as known to the younger girls.

The classification of the reading material was necessarily rough and rather unsatisfactory. However, the love of fairy tales stands out strongly as the choice of literature among the younger children, ranging from the maximum of over two-thirds at the ages of six to eight years to just one or two choices at the ages of thirteen or fourteen. From the ages of eleven to sixteen years, girls' series occupy one-third or more the total selection while in the last group of girls only a small proportion name these books. Adventure and romantic tales constitute an increasing number of choices from the thirteen year old girls on to the oldest.

The vocational chart shows a striking narrowness of outlook; the three professions of teaching, nursing and stenography filling very nearly the whole horizon. Apparently the number of possibilities diminishes as the child grows older, for the younger girls name a variety of home occupations and even quite a large miscellaneous group of professional interests which are lacking among the older girls. The failure on the part of the older girls to include the home occupations among the vocations, results in some measure from the general plan of girls' education as it has been arranged till recently; with no training in home making or home managing. This condition of affairs must be in part a reflection of the social taboo that forbids the official acknowledgment of home and family making in any scheme for planning the lives of young people. The schools are beginning to realize that this is cause for a serious indictment against them, and



considerable attempt is being made to change it. But a more vigorous effort must be made if the conditions facing us on every hand are to be satisfactorily dealt with.

Turning to special features brought out in the course of the study, in the recreational and vocational divisions there were certain items of particular interest. Direct correlation between these two lines was not often possible. In only fifty-eight cases, all told, did the girls express the wish to take up a profession along the lines in which their favorite pastimes lay, and the fields were markedly limited in which this correlation was noted—mainly those of music, art, athletics, and sewing, in the order given. A few other girls who enjoyed playing “school teacher” thought they would like to teach and one or two who enjoyed home duties as recreation expressed a wish to do housework. Examples of the correlated cases are as follows:

Girls who enjoy playing the piano hoped to become music teachers or play professionally; girls who liked to draw wished to become artists or designers; those enjoying various forms of athletics and outdoor activities wanted the chance to become gymnasium teachers; and girls taking pleasure in sewing thought that dressmaking would suit them professionally. The ages of these girls whose pleasure in a pastime was strong enough to urge them to follow it up with a similar vocation varies between twelve and sixteen; over half of the girls being thirteen and fourteen years and three fourths between the age of twelve and fifteen.

A feature already brought up in relation to the vocational side of the study which may be emphasized still further here, is the evidence on every hand of the girls’ narrowness of horizon as regards possible future occupation. Many a girl’s answer as to why she had chosen stenography, for instance, was “because she didn’t like teaching” or as to why she had decided on nursing, “because she didn’t think stenography would suit her.” There was, on all sides, a lack of any healthy, ambitious attitude regarding possibilities, and frequently an uninterested tone of resignation when speaking of future plans. That such conditions should exist when hundreds of occupations are now open to women, constitutes a challenge to our educational methods. We provide a single, rather rigidly planned system through which children representing the greatest possible variations must pass. Likewise this human material, on emerging from the unified system is required to fit into innumerable different places in the world’s activities. We must, therefore, expect great limitations in the finished product until



we are ready to hold more closely to the needs of the individual, together with those of the working world, as models upon which to formulate school programs.

To any one seeking hints suggesting some variations from the stereotyped line of occupations, there was more or less material available among the pastimes enumerated by certain girls. It is to be regretted that in most schools there is no scheme operable by which these impulses can be made of maximum usefulness to the girl. This opportunity when given to a trained prevocational or vocational teacher, may be of great value. Such a person may, at least, suggest to the girl who delights to shop above all else, that there is such a profession as shopping. In such a case which came under notice here, the possibility had never been heard of and the girl was one of those added to the ranks of the three most popular professional preferences, in this instance, nursing. Likewise, that girl who delights in writing stories, in reading history, and in seeing historical movies, might be encouraged to try her hand as scenario writer of historical dramas, rather than to rest content with being a stenographer.

Among the girls choosing stenography as a profession, several characteristics which did not come to the surface noticeably in any of the other professions were in evidence. One of these was an excitement-loving tendency. The girl wanted to see "real life," to have "business adventures," or to be where people did "big things." There was also that "easy money" theme in evidence, and often, without attempt at concealment, the sex instinct was conspicuous, expressed as a frank desire to know and mingle with men.

The only times when the parents were brought directly into the discussion were when the girls themselves happened to mention them. This occurred almost exclusively in connection with the question of future occupation. In thirty-four cases the girls spoke of either mother, father or their "family" and in twenty-five of these it was to state that the wishes of their elders differed decidedly from their own. Of course the fact that there had been opposition may have been a memory-stimulating element in many of these cases, causing the parents to be thought and spoken of; and probably a two-thirds ratio over estimates average parental opposition. However, we do know from other sources that parental antagonism is a prominent factor in very many upset lives. Therefore, evidence on various aspects of the problem may serve an end. An analysis of these cases shows that eleven of the twenty-five contrary-minded parents

never suggested an alternative occupation for the girl, but simply let it be known in more or less forcible terms, that they were against that particular kind of work for their daughters—negative guidance to say the least. Other parents presented reasons for the selection of different plans for their children's future, but not many of these appear to be any more rational than the negations represented above. Twelve of the opposed girls had chosen nursing, six of them met with flat opposition without reason. To the others it was said that nursing was too hard work, was not nice work, that the girl had no talent, or that she had better be a stenographer or that she should stay at home and do no work. One was advised by her father to become a movie actress. Five girls desiring to be stenographers received equally strong opposition; in two instances the parents protested that the girl ought not to work if not forced to by necessity; in two others parental preference was expressed for the teaching profession and another girl was urged to become a singer. Whether this last suggestion, and the preceding one of the movie acting were made by the parents in a spirit of sarcasm or whether ability really was present, was not determined. Two of four girls wishing to be teachers were met with plain, ungarnished opposition, while one of the other two had stenography and the other the medical profession proposed as alternatives. The remaining four cases in which the girl's scheme and that of her parents conflicted, present rather similar characteristics; there was the girl who wanted a home of her own who was urged to prepare herself for teaching; another who thought she would like to be a missionary was advised strongly to be a stenographer; the same advice being given to another young woman desiring to take up playground work. A girl who wanted to prepare herself to be an artist was told in forcible language by her parents that it would be a waste of time. It may be said that according to commonly accepted views, in the last five instances the parents' advice appears to be a "practical" nature.

While we cannot make a really thorough estimate of the merits of any of the foregoing situations, one or two features in regard to the attitude of parents certainly can be judged intimately enough to be vigorously condemned. In the first place any uncompromising or arbitrary standpoint is almost sure to be associated with, and provocative of a most harsh and ungracious spirit in all concerned; in the second place, the point of view which undervalues the real need of work or looks down upon it as demeaning, is essentially wrong and



usually has most unhappy consequences. Then a dominating personality, attempting to decide another's scheme of life or to map out an unsuited plan of conduct for that individual is apt to cause such disaster as no amount of later adjusting can entirely remedy. Such antagonistic situations occur rather typically at the transition time when the child, of necessity, passes from a state of greater or less obedience in regard to the parent to one of more independent thought and action. The parents oftentimes will not acknowledge even to themselves the defiance that appears in the child's attitude, they cannot grasp the fact that if they are to exert influence at all, the time has come for cooperation and guidance rather than arbitrary commands. Warnings and danger signals for the guidance of the parents are not lacking; they can be seen plainly in the lives of our young people, but it appears to be frequently an unwelcome task for parents to even acknowledge their existence. And in addition to this, the qualities necessary to profit by these warnings such as quiet observation, unbiased judgment and spirit of "hands off" are incompatible with parental dogmatism.

In nine other cases of the preceding group of thirty-five the parents and the children were in accord. In five of these the girl herself had no preference; with two of this number the parents chose stenography, two teaching and one factory work. In the remaining four, the girls as well as their parents selected respectively a singing career, acting, nursing and stenography.

In concluding the discussion of this study certain personal qualities and practical implications must be mentioned. There was present in the girls interviewed, the exuberant enthusiasm of youth which, while most attractive and a great stimulus to come in contact with, showed a decided need of being stabilized before it could possibly develop into the useful factor that it should be.

The readiness for group enterprises found among the older children's games and recreation suggested possible benefits which might come through a healthily directed get-together spirit; but it also warned against the possible degeneration of this motive, as seen in servile "toadying," copying, and in mean clannishness. The demand for greatly augmented opportunities and facilities to satisfy physical needs and recreation was always apparent and frequently it seemed as though the time was far distant when this situation would be satisfactorily met for the great majority of children. There were indications on every hand that time, place and leadership all must be included



in furthering a satisfactory scheme for really meeting this fundamental problem. No aspect of the question that helps toward making an adequate and effectual program for physical needs should be neglected.

Taken all together the situation and facts above narrated present themselves as do most questions related to the lives of young people, as engrossing problems, for the clarifying of whose difficulties help must be sought from as many available sources as possible. Educator, psychiatrist, vocational teacher, student of physical development and of physical education, all contribute data from which guidance must be taken if the best course of action is to be found. It is essential that workers in the so-called practical fields come to be familiar with the really practical significance of this guidance and act accordingly.

### BOOK LISTS

#### GROUP I. SIX TO EIGHT YEARS:

<i>Jack and the Bean Stalk</i>	6-10 yrs.	Mrs. Dorish Maria Graik (Miss Mulock)
<i>Red Riding Hood</i>	6-12 yrs.	Mrs. Dorish Maria Graik (Miss Mulock)
<i>Jack the Giant Killer</i>		Mrs. Dorish Maria Graik (Miss Mulock)
<i>Tom Thumb</i>		Mrs. Dorish Maria Graik (Miss Mulock)
<i>Dick Wittington and Big Cat</i>		James Baldwin
<i>Three Pigs—"Pig Brothers"</i>		Sara Cone Bryant
<i>Three Bears</i>		Sara Cone Bryant
<i>Goldi Locks</i>		Joan Mace
<i>The Golden Bird</i>		Eva March Tappen
<i>The Mermaid's Gift</i>		Julia Brown
<i>Fox and Grapes</i>		Aesop's Fables
<i>Roland</i>		James Baldwin
<i>Little Jack Horner</i>		J. W. Elliott
<i>Bo-Peep</i>		J. W. Elliott
<i>Old Mother Hubbard</i>		E. O. Grober
<i>Little Miss Moffet</i>		Mother Goose Rhymes
<i>Birdy with the Yellow Bill</i>		
<i>Camel and Jackal</i>		
<i>The Child's Story Book</i>		
<i>Billy Whiskers</i>		
<i>Daniel in the Lion's Den</i>		
<i>Christmas Story—Little Boy in a Cradle</i>		

GROUP I. NINE TO TEN YEARS:

<i>Eight Cousins</i>		Louisa May Alcott
<i>Rose in Bloom</i>		Louisa May Alcott
<i>Little Women</i>	9-17 yrs.	Louisa May Alcott
<i>Mary Cary</i>	9-12 yrs.	Kate Boshier
<i>Susie Books</i>	9-12 yrs.	Sophie May (Series)
<i>Dotty Dimple</i>		R. S. Clarke (Series)
<i>Bobsy Twins</i>	6-14 yrs.	
<i>Little Colonel</i>		
<i>Little Peppers, Pepper Books</i>	9-16 yrs.	Margaret Sidney (Series)
<i>Two Little Knights of Kentucky</i>	9-14 yrs.	Annie Fellow Johnston
<i>Uncle Tom's Cabin</i>	9-12 yrs.	H. B. Stowe
<i>Beautiful Joe</i>		M. Saunders
<i>Uncle Remus</i>		Joel C. Harris
<i>East of the Sun and West of the Moon</i>		Andrew Lang
<i>Peter Rabbit</i>		Mary Stone
<i>Grandmother's Fairy Tales</i>		Charles Robert Dunns
<i>Marco Polo</i>		Eva March Tappan
<i>Marta in Holland</i>		E. A. B. MacDonald & J. Dalrumple
<i>Dorothy Dandy's New Friend</i>		
<i>Miss Gibbee Galt</i>		
<i>Friday's Child</i>		
<i>Story of Jesus</i>		
<i>Journeys Through Bookland</i>		
<i>Little Pictures</i>		

GROUP II. ELEVEN TO TWELVE YEARS:

<i>Girls of Friendly Terrace</i>		Harriet L. Smith
<i>Seven Little Sisters</i>		J. Andrews
<i>Lena Rivers</i>		Mary Jane Holmes
<i>Natalie's Sister</i>		Anna C. Ray
<i>Veronica Playfair</i>		Blanche W. Goodwin
<i>Tom Sawyer</i>	11-16 yrs.	S. L. Clemens (Mark Twain)
<i>Pussy Black Face</i>		Marshall Saunders
<i>Alice in Wonderland</i>	9-14 yrs.	Lewis Carroll
<i>Just David</i>	11-16 yrs.	Eleanor Porter
<i>Hans Brinker and the Silver Skates</i>	11-14 yrs.	Mary Dodge
<i>Mrs. Wiggs of the Cabbage Patch</i>	11-16 yrs.	Kate D. Wiggins
<i>Lady or the Tiger</i>		Frank B. Stockton
<i>Little Lord Fauntleroy</i>		Mrs. F. H. Burnett
<i>Blue Beard</i>		Andrew Lang
<i>The Enchanted Canary</i>		Andrew Lang
<i>The Lamp Lighter</i>		Robert Louis Stevenson
<i>Evangeline</i>		H. W. Longfellow
<i>Dick Among the Lumber Jacks</i>		Anthony W. Dimock
<i>Pilgrim's Progress</i>		John Bunyan

<i>Ischmael</i>	11-14 yrs.	Frederick A. Lang, F. E. I. S.
<i>Riverside Readers</i> (8 volumes)		James H. Van Sickle & Wilhelmina Seegmille
<i>Oliver Twist</i>		Charles Dickens
<i>David Copperfield</i>	11-16 yrs.	Charles Dickens
<i>Christmas Carol</i>		Charles Dickens
<i>Doris' Fortune</i>		
<i>Esther Read</i>		
<i>Daddy's Girl</i>	11-14 yrs.	
<i>Sue, A Little Heroine</i>		
<i>Liddy's New Home</i>		
<i>Pretty Set</i>		
<i>Bob Burton</i>		
<i>Tom Playfair</i>	11-14 yrs.	
<i>Missy and Master</i>		
<i>Wait and Hope</i>		
<i>The Nature of the Woods</i>		
<i>Heart Book</i>		
<i>Blue Bird</i>		
<i>Lamb's Tales of Shakespeare</i>		
<i>The Boys</i>		
Authors Chosen—Girls not naming Books:		
Louisa Alcott.....	11-14 yrs.	Grace Harlow.....11-21 yrs.
Mark Twain.....	11-12 yrs.	Miss Mead.....11-16 yrs.
Types of Books Chosen—Girls not naming particular titles:		
Girls Series.....		11-14 yrs.
Boarding School Stories.....		11-17 yrs.
Italian Novels		
Greek Mythology		
History.....		11-21 yrs.
History and Geography		
Funny Books.....		11-16 yrs.
Short Stories		
Continued Stories		
Biography.....		11-14 yrs.
St. Nicholas		
Bible Stories		
Camp Fire Girls		

## GROUP III. THIRTEEN TO FOURTEEN YEARS:

<i>Elsie Dinsmore</i>	11-16 yrs.	Martha Finley (Series)
<i>Ann of Green Gables</i>	11-16 yrs.	L. M. Montgomery
<i>Sarah Crew</i>		Frances H. Burnett
<i>Little Colonel</i>	9-18 yrs.	Annie F. Johnston
<i>Rebecca of Sunnybrook Farm</i>		Kate D. Wiggins
<i>Emma Lu</i>		Mary M. Mears
<i>Little Folks Astray</i>		Rebecca S. Clarke
<i>Peg O' My Heart</i>		J. H. Manners



*Tess of the Storm Country*  
*Little Runaway*  
*The Whirlagigs*  
*Tarsan of the Apes*  
*Mysterious Island*  
*Riders of the Purple Sage*  
*Daughters of the Revolution*  
*Silas Marner*  
*Swiss Family Robinson*  
*The Deerslayer*  
*Treasure Island*  
*Kidnapped*  
*Robinson Crusoe*  
*Hoosier School Boy*  
*Huckleberry Finn*  
*Meadowbrook Girls*  
*Girls of Deep Dale*  
*Polly, the New Fashioned Girl*

11-14 yrs.

Grace M. White  
 Grau Johanna Spyre  
 Sydney Porter (O. Henry)  
 Edgar R. Burroughs  
 Jules Verne  
 Zane Grey  
 Catherine M. Bearne  
 George Elliott  
 Jahann von Wyna  
 James F. Cooper  
 Robert L. Stevenson  
 Robert L. Stevenson  
 Daniel Defoe  
 Edward Eggleston  
 Samuel Clemens (Mark Twain)

GROUP III. THIRTEEN TO FOURTEEN YEARS:

*Poor and Proud*  
*Shifting for Himself*  
*The Cash Boy*  
*Fairview Boys*  
*Two Orphans*  
*English Orphans*  
*Since Dorothy Learned the Truth(?)*  
*Her Only Sin(?)*  
*Mistress over the Way*  
*Moving Picture Girls*  
*Peggy Owen*  
*Lilly of Mordant*  
*King Arthur—Howard Pyle*  
*Robin Hood*  
*Motor Maids*  
*Across the Pacific*  
*Ocean Wireless Boys on the Atlantic*  
*The Girl Aviator*  
*Little Flowers of St. Francis*

9-14 yrs.

11-14 yrs.

Authors Chosen—Girls not naming particular books:

Alger.....	11-16 yrs.	Scott.....	13-21 yrs.
Montgomery		J. S. Porter	
Dickens			

Types of Books Chosen:

College Girls.....	11-16 yrs.	Home Library	Indian Stories
Animal Stories.....	11-21 yrs.	Geography	Red Cross Books
Exciting Stories .....		Jungle Series	Series
		High School	

## GROUP IV. FIFTEEN TO SIXTEEN YEARS:

<i>Daddy Long Legs</i>		Jean Webster
<i>A Girl from America</i>		Frank Stockton
<i>Girl of the Limberlost</i>	13-21 yrs.	Jean S. Porter
<i>Ramona</i>		Helen Hunt Jackson
<i>The Story of Julia Page</i>		Kathleen Norris
<i>Pollyanna</i>	10-16 yrs.	Eleanor Porter
<i>When Patty Went to College</i>		Carolyn Wells (Series)
<i>Alice of Old Vincennes</i>		Maurice Thompson
<i>The Wide Wide World</i>		"Ouida"
<i>Barriers Burned Away</i>		E. P. Roe
<i>At the Mercy of Tiberius</i>		Flora A. Steel
<i>Shepherd of the Hills</i>		Harold B. Wright
<i>Eyes of the World</i>		Harold B. Wright
<i>Trail of the Lonesome Pine</i>		John Fox
<i>Secret Garden</i>	10-21 yrs.	Frances H. Burnett
<i>The Rosary</i>	13-21 yrs.	Florence Barclay
<i>Buelah</i>	13-16 yrs.	Augusta Evans
<i>Red Pepper Burns</i>		Grace Richmond
<i>Master's Violin</i>		Myrtle Reed
<i>Felix Adair</i>		Francis H. Smith
<i>The Harvester</i>	15-21 yrs.	Jean Stratton Porter
<i>Lavendar and Old Lace</i>	15-21 yrs.	Myrtle Reed
<i>Freckles</i>	10-21 yrs.	Jean Stratton Porter
<i>When Knighthood was in Flower</i>		Major Caskoden
<i>Scottish Chiefs</i>		Porter
<i>Last of the Mohicans</i>		James F. Cooper
<i>Phillippa</i>		Arlo Bates
<i>Under Two Flags</i>		"Ouida"
<i>The Street of Seven Stars</i>		Mary Roberts Rinehardt
<i>Peck Stories</i>		Harry T. Peck (Series)
<i>Quo Vadis</i>		Harry Sinkiewicz
<i>Count of Monte Cristo</i>		Alexander Dumas
<i>The Crossing</i>		Winston Churchill
<i>Brewster's Millions</i>		
<i>Shadow of the Flame</i>		
<i>Tempest and Sunshine</i>	10-21 yrs.	
<i>Grace Lords</i>		
<i>Motor Boat Boys</i>		
<i>Peggy Stewart Books</i>		
<i>Tom Swift Series</i>	13-16 yrs.	
<i>Rover Boys (Series)</i>		
<i>The Enchanted Bark</i>		
<i>Story of Wailsteel Barter</i>		
Authors Chosen—Girls not choosing particular books:		
J. S. Porter.....	13-16 yrs.	
M. R. Rinehardt		
R. L. Stevenson		
C. B. McCutcheon.....	15-21 yrs.	
Miss Mead		

Types of Books Chosen—Particular Titles Not Named:

Boys Books.....	11-21 yrs.	Detective Stories...	15-21 yrs.	Adventure
Novels.....	13-21 yrs.	Local Color Books..		Girl Books
Mystery Stories..		Funny Stories		Camp Fire Girls
		Magazine Stories		Orphan Stories

GROUP V. SEVENTEEN TO TWENTY ONE YEARS:

<i>Just Patty</i>		Carolyn Wells
<i>Truth Dexter</i>		Sidney McCall
<i>Black Beauty</i>	13-21 yrs.	Molly Seawell
<i>Laddie</i>	11-21 yrs.	Jean Stratton Porter
"K"	15-21 yrs.	Mary Roberts Rinehardt
<i>Infelice</i>	15-21 yrs.	Augusta Evans
<i>Little Shepherd of Kingdom Come</i>	15-21 yrs.	John Fox
<i>Amarilla of Clothesline Alley</i>		Clara B. Mainates
<i>The Imposter</i>		John B. Scott
<i>Red Rock</i>		Thomas Nelson Page
<i>Dawn of the Morning</i>		Grace Lutz
<i>Bars of Iron</i>		Ethel Dell
<i>The Way of an Eagle</i>		Ethel Dell
<i>Michael O'Halloran</i>		Jean Stratton Porter
<i>To Have and to Hold</i>		Mary Johnston
<i>Over the Top</i>		Guy Empey
<i>Macbeth</i>		Shakespeare
<i>Ivanhoe</i>	11-21 yrs.	Sir Walter Scott
<i>St. Elmo</i>	15-21 yrs.	Augusta Evans
<i>Richard Carvel</i>		Winston Churchill
<i>Adventures of Kathleen</i>		
<i>The Heart of the Desert</i>		
<i>Victory of Allen Rutledge</i>		
<i>Mother's Sacrifice</i>		
<i>Gypsy's Cousin Joe</i>		

Authors Chosen—Girls not naming books:

H. B. Wright	Victor Hugo
Myrtle Reed	Elliott
Shakespeare	Jack London
John Churchill	Booth Tarkington
Fox	Conan Doyle
Crawford	Grace Richmond

Title of Books Chosen—Girls not naming particular titles:

Adventure.....	11-21 yrs.	Girls—School and College Stories
Love Stories.....	11-21 yrs.	War Stories
Daily Papers.....	11-21 yrs.	History
Western Stories.....	13-21 yrs.	Historical Novels
Magazine Stories.....	15-21 yrs.	



# AN APPROACH TO THE SYNTHETIC STUDY OF INTEREST IN EDUCATION: PART IV

DOUGLAS WAPLES

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## CHAPTER SIX. EDUCATIONAL IMPLICATIONS

Any discussion of the means by which various forms of interest can be objectively controlled presupposes the ability to detect these interests in the individual's behavior. As implied throughout previous discussion, these forms of interest should be distinguished by the ends sought in a particular environment. In the attempt to distinguish these forms by congenital capabilities, the suggested classification by types, etc. is obviously too broad to be serviceable. It is therefore necessary that each capability be rated by thorough clinical examination before the individual's "educability" or chance of attaining these ends can be definitely known.<sup>1</sup> Interests themselves are inferred both from (1) subjective estimates based on observation of various expressions and (2) quantitative estimates based on observation in measurable performances. Both approaches include many useful methods which might well be discussed in connection with former analysis, yet such discussion may not be entered here. Instead it may prove sufficient to note certain assumptions involved in the discussion to follow.

The first of these postulates that the interest most profitably diagnosed should mediate between momentary preferences and uniformly permanent tendencies of original nature. The relative element is necessary to indicate the point of approach; the absolute element to prevent reliance upon mere caprice. That interest in the given individual which best serves the educational purpose may therefore be roughly indicated by the ends in a given environment which he habitually puts forth most effort to attain and with which he habitually identifies himself. Thus defined, it is evident that all methods which require accurate observation of behavior are valuable. It is further necessary to emphasize the distinction between the use of various methods to discover interests and their use to direct interests. Even by quantitative tests of competencies, it is often possible to direct interest toward a previously distasteful activity

<sup>1</sup> For helpful classification and description of these capabilities see H. J. Humpstone: *The Analytical Diagnosis. The Psychological Clinic*, May 15, 1919.

by convincing the subject that he has the required ability.<sup>1</sup> The effective means of rating "dynamic qualities" by observation proposed by Rugg<sup>2</sup> is devised with this end directly in view. Its important features are two: the self-improvement of students through self-rating, and measurement by direct comparison. The latter is the most reliable form of subjective estimate. While the use of such score cards does not eliminate prejudice, it does much to define the qualities estimated and to reduce the liability of error, as shown by occasional correlations between subjective and quantitative ratings of the so-called measurable traits.<sup>3</sup> When interest is observed in its most spontaneous expression as in dramatics, athletics, and other extra-curriculum activities, such ratings become highly reliable. The value of quantitative studies as a basis for inference regarding relative differences depends greatly on knowledge of the individual's previous experience. If allowance is made for the irregular rate of mental development, the effect of laboratory conditions, and the imperfections of scales now in use, a wide variety of performance tests may indicate the probable remoteness or span of interest,<sup>4</sup> the extent of development or genetic stage of interest, and also those activities best suited to specific abilities in which interest is normally most intense. In short, it appears that diagnosis of interests as described, requires the use of standard tests to determine capabilities, the widest practicable observation of behavior to determine relative factors, and adequate, progressive, and available records of such behavior for the guidance of all concerned.

The attempt to relate phenomena of interest to specific educational controls with any degree of precision requires that the nature and effects of both be scientifically described. Quantitative measurement and classification of interest lies beyond all present hope, yet scientific description of various stimuli and of their apparent effects upon behavior under standardized conditions is not only possible but is essential to the confirmation and intelligent use of theories herein considered. The Chapman and Feeler experiment, noted in the first chapter of this article, is typical of many studies leading

<sup>1</sup> H. C. Link: "Employment Psychology," p. 208.

<sup>2</sup> *School Review*, May, 1920.

<sup>3</sup> H. C. Link, *op. cit.*, p. 332 gives reasons for this reduction of error; L. M. Terman: "Intelligence of School Children," pp. 57ff. mentions certain rather questionable correlations.

<sup>4</sup> *cf.* E. K. Fretwell: A Study in Educational Prognosis. *Teachers' Col. Cont.*, No. 99, p. 303.



to this end whose conclusions to date are nevertheless too fragmentary to serve as corroborative evidence. The same is in general true of educational controls. By analogy with a principle of industrial efficiency, which requires that the best means of arriving at standard attainments should be adopted as standard operations and consistently employed so far as standard conditions will permit,<sup>1</sup> education must extend its scientific description of various products to include those *processes* by which under standard conditions each product is best attained.<sup>2</sup> Otherwise it is difficult to see how principles of method can be transferred from educational theory to educational fact. It is not intended that these principles involved in efficient management of any enterprise should be applied to education in merely a figurative sense. Their actual application becomes evident when the pupil takes the place of the industrial worker, who is guided by superiors in performing such operations as lead to various attainments determined by the aim. For the pupil these attainments comprise the various proficiencies or educational products that result from various operations in the process. The remainder of the discussion in developing this point of view is confined to a purely theoretical account of motivation in terms previously used.

The term motivation may here be understood to mean the stimulus to such self-activity under prescribed conditions as tends to modify later activity in a desired direction. A most superficial view of the process reveals the fact that this stimulus may come either from the conditions themselves, or from outside, or from both. In terms of educational theory, the prescribed conditions may be identified with course of study and the outside stimulus with method. To the same degree that the standard conditions and standard operations of industrial efficiency are both responsible for the standard attainment, both course of study and method are involved in the educational product. Together these constitute the motivating process with which we are chiefly concerned, yet by the theoretical distinction each may be considered separately. The product is the cross section

<sup>1</sup> cf. H. Emerson: "Twelve Principles of Efficiency," Chap. XII and H. Updegraff: "Scientific Management in Educational Administration," *Univ. of Penna. Free Lectures*, 1913-14, pp. 350-64, whose current research is pioneer work in this field. The term "standardization" as applied to educational method and products is here used in the industrial and not in the statistical sense. It means simply the selection and maintenance of the best method, product, etc. under specified conditions.

<sup>2</sup> As advocated by Rugg, *op. cit.*, p. 340.



of the process, which like the standard attainment is best defined in terms of process. This means that neither knowledge, interest, nor action should alone constitute the desired product, but that all three with their many implications should be taken into account so far as may be practicable.

As the standard conditions of efficient enterprise are made as favorable as possible with reference to the particular aim, the course of study should likewise be determined by the educational aim, or in other words by the needs of the individual pupil. Such needs as typical of large groups in various conditions of modern society have been analyzed from many different standpoints.<sup>1</sup> The various aims resulting from such analysis can in general be said to seek a happy compromise between certain competencies which society demands as a condition of full membership in the social order and the fullest development of the individual's native endowment. This mutual development of individual and social traits should then result so far as possible from the pupil's contact with the situations which comprise the course of study. The effectiveness of a particular situation to afford such development in the individual case is the criterion for its selection.

It is evident that in order to estimate this effectiveness one must anticipate those individual and social traits that are most valuable in the child's later experience. To the degree in which his behavior under present conditions is normal one may closely predict the later conditions by analogy with the experience of others whose behavior was similar at the same stage of development. By a preliminary statement this experience was shown roughly to comprise feeling and interest in a situation, action in such interest, and knowledge of the effects of such action. The comparison of present with probable future experience involved in selecting the effective course of study should then make due allowance for each element; and each, we have said, must also appear in the standard attainment or product by which the efficiency of both course of study and method is measured.

The departure of traditional practice from this ideal is largely explained by a fallacy of Herbartian psychology which regarded

<sup>1</sup> e.g. J. T. Bobbitt: "The Curriculum."

J. & E. Dewey: "Schools of Tomorrow."

A. D. Yocum: The Determinants of the Course of Study. *N. E. A. Proc.*, 1914. Nat. Soc. for Study of Education, 16th, 17th, and 19th Year Books, Part I.

ideas or knowledge as the sufficient explanation of interest. Hence to determine the traditional "text-book" course of study the educator had merely to tabulate the useful forms of knowledge,<sup>1</sup> take stock of the pupil's acquirement of each, and prescribe accordingly. In so doing he ignored the fact that analysis of residual knowledge is not analysis of behavior. Command of mere facts in no way ensures a useful attitude regarding them nor the probability of useful action as a result. Approaching the course of study from the opposite angle some "schools of tomorrow" err to the other extreme. Adapting the teaching situation to the tendencies of individual behavior not infrequently leads to reliance upon mere caprice. The integrating factor is minimized and the differentiating factor is supreme. Hence "problem-project" situations are only efficient to the degree that the pupil's action involves progressive standard attainments which apply to his case and which so far as possible are systematically planned in advance. Thanks to the present broadcast experiment such problem courses are rapidly becoming highly efficient in this respect. Yet to harmonize these two criteria—the universal knowledge requirement on the one hand and expression of individual interest on the other—there is need for the truly scientific analysis of behavior that shall bring all important factors of experience into proper perspective and that shall define these factors in terms of genetic development. The more quantitative such definition becomes, the more directly useful is it in determining the course of study. The greatest contribution of such analysis must consist in the more precise definition of aim that permits definition of standard attainments in terms of operations.

This outline of the problem may serve to justify the synthetic study of interest as one means of approach. As described in the theoretical terms of foregoing chapters such study thoroughly pursued must do much to standardize efficient educational procedure, since its actual completion implies the closer relation of the learning process to specific educational controls. The nature of that interest in which useful action is taken and useful knowledge acquired might then serve more largely to determine the individual course of study. Pending such conclusive experiment the theoretical criteria for selection of teaching situations must include the following: (a) relative differences, *i.e.* inference from the pupil's reactions as to the prevailing trends of interest; (b) absolute differences, *i.e.* inference from various

<sup>1</sup> As proposed most scientifically by Bobbitt, *op. cit.*



painstaking achievements as to the capacity for its realization under specific conditions; (c) inference from the experience of adults similarly endowed in the above respects as to the effects of such realization; and (d) inference from society at large as to the inevitable recurrence and applicability of the situation in later life for all individuals.

The ideal course of study consisting entirely of such situations as are fully adapted to individual needs must render the teacher superfluous. The demand for external motivation decreases as this intrinsic efficiency is approached. Thus while there is no clear difference in theory between course of study and method from the standpoint of motivation, the practical nonexistence of the ideal situation refers motivation almost entirely to method. In practice the function of content is simply to provide occasion for such experience as behavior shows to be most desirable at a given time. The functions of method are, essentially, (a) to promote sufficient activity to acquire this necessary experience, (b) to direct this experience toward various desirable ends, and (c) to cause each of these ends to be pursued upon appropriate future occasions. Thus the ideal method is almost equally independent of content, since almost any situation may provide occasion for some useful experience.

This relation of content to method and the later application of efficiency principles to both may be clarified by a random illustration of the learning process. We may suppose each of the primary types of interest to be represented by a vapid *femme-du-monde*, a cub-reporter, and a professor of dramatic literature,—all attending a production of a racy problem play. If the apperceptions of each are true to type, one may expect the lady to yield readily to intrinsic absorption in the lure of the matinee idol. The reporter is restrained from such indulgence by the practical demands of his write-up. The professor from the depths of his dramaturgy may properly inquire—‘how can such trash be written?’ It is evident that behavior is sufficiently motivated by the content in the sense that a fair amount of activity results in each case. It is equally evident that other content might better suit the needs of the three individuals. Yet in selecting this other content the educator is greatly assisted by study of each response to the play, which may stand for any characteristic behavior. The above criteria for selection of course of study here apply. The supplementary function of method involves the direction of this activity to the end most useful for the individual: the



lady's riot of feeling must be directed to certain useful and recurrent aspects of the situation; the reporter's concentration upon superficial features affecting him alone should admit some of the professor's social theory; while the professor, if not fully attained, may well profit by something of the other two. His interpretation of catharsis may doubtless be enriched by attention to the applause of the box-party: theoretical becomes rational interest. It is this normal variation from personal impulse through the socially obvious to the socially rational which marks the degrees of the learning process.

Since the higher degrees of this process are most readily distinguished from the lower by the useful knowledge acquired, progress is customarily judged by attainments in knowledge alone. Five such degrees of retention are clearly distinguished by Yocum<sup>1</sup> as forgotten knowledge, barely retained, many-sided (or depending upon various occasions for revival), definite, and generally applicable. Hence the formal steps of instruction, the plan of text-books, and methods of instruction in general have conformed to this sequence. Such standard attainments as these, whether applied to the course of study as a whole or to a particular subject or part of a subject, are inefficient when they disregard other elements essential in the process. The standard operations,<sup>2</sup> or methods of reaching such attainments, are consequently inadequate also. To improve the efficiency of standard methods one must so revise the standard attainments that together these shall constitute a fuller realization of aim. We have noted that this aim involves the reciprocal functions of interest and knowledge. Inadequacy of useful knowledge, when recognized, is the source of new interest, and new interest the source of new knowledge. Hence the failure to realize expectations with regard to a situation marks the rise to a higher form of retention and a more adequate control.<sup>3</sup> This relation suggests a theoretical correspondence between furtherance of interest and growth of knowledge by which the affective element may be included in the standard attainment and accordingly recognized in the standard operation. In terms previously defined these stages in the furtherance of interest may be distinguished as follows: First, interest in the present situation. Second, the interest expressed in the present situation finds expression in the idea of it. Third, interest in the idea includes ideas of similar situations de-

<sup>1</sup> A. D. Yocum: "Culture, Discipline and Democracy," pp. 31ff.

<sup>2</sup> cf. H. Emerson, *op. cit.*, Chap. XII.

<sup>3</sup> W. Mitchell, *op. cit.*, p. 312.

manding the same sort of behavior because appealing to the same type of interest. This stage might be reached when the discovery of pleasure in poetry leads to a similar discovery in music, or where success in one undertaking inspires success in others, or when cognitive interest in a particular field leads to deeper respect for scholarship in general. Fourth, activity in one type of interest becomes habitual in particular situations. Fifth, habitual expression becomes socialized, and the nature of the interest expressed is determined by the social requirements of the situation; hence behavior is at all points in closest conformity with reality. The scale of interest is probably no more and no less useful than the scale of retention except in so far as the attainment of each degree is less readily determined. It has perhaps the advantage of being unsuited to group application, and of directing the teacher's attention to the individual response.

If regarded as tentative standard attainments, these degrees of knowledge and of interest combined must determine the operation to be standardized. Those particular operations or methods leading most directly to the attainment desired should be selected for application at various stages of the process. Hence on the basis of these progressive attainments it should be possible to distinguish the general functions of method in motivation which have been selected upon purely logical grounds; namely, the stimulation of activity, its direction toward desired ends, and its reproduction upon appropriate occasions. Each of these functions may be outlined in turn to suggest varieties of interest involved in each attainment and consequently in the process as a whole.<sup>1</sup>

Whether considered genetically or as applied to all learning, the first three attainments may be related to the first function,—mere stimulation of activity. Before interest in a particular form of experience has become habitual and knowledge of it has become definite, behavior is directed toward the situation *as an end in itself*. Such behavior is largely experimental until the expectations regarding such situations have been justified by experience and their fulfilment is taken-for-granted. This experimental aspect of behavior suggests that progress through the first three attainments is motivated by expression of instinctive interest. The fact of such expression insures activity of some sort, and progress from one to another of these

<sup>1</sup> cf. A. D. Yocum, *N. E. A. Proceedings*, 1914, pp. 223-235, for an analysis of method in terms of knowledge attainments with which this treatment in terms of interest closely agrees.



attainments results from the increasing scope of activity as the types of instinctive interest evolve.

All activity is stimulated at first by interest in the mere situation which has no meaning other than its appeal to purely intrinsic interest. The force of this appeal is apparent in all forms of behavior in that things nearer sense are always the more influential.<sup>1</sup> In later expression attention varies with interest, but interest does not vary with attention. Interest in the mere situation does vary with attention inasmuch as to captivate attention is to motivate activity. The operations for producing involuntary attention as suggested by the varieties of purely intrinsic interest are familiar from daily observation. They consist in various sensory stimuli whose intensity is explained by such qualities as novelty, contrast, rhythm, movement, *et al.* Organic factors cause attention to persist, through none save the motor can be stimulated directly. The more the situation meets an instinctive want, the longer is the series of movements attended to. The intensity of stimulus should, however, be neither too high nor too low; otherwise it fails to take effect.<sup>2</sup> The great variety of such controls, as used in reaction time experiments, for example, suggest many means of producing some activity in any situation. The effect of such activity is mere contact with prepared conditions to which meaning may later be given.

Interest in the idea or meaning of the situation is essentially practical. The situation, though still an end in itself, is utilized. Hence activity is motivated by such instinctive interest as recognizes in the situation an occasion for achievement. To be recognized at all some knowledge of the situation must have been acquired from a former contact with it, but ignorance of this knowledge may result either from lack of interest or from too much interest beyond control. In the former case the problem of motivation is to ally the situation with what does have interest, which means, in the last analysis, with pleasant or painful consequences. This is done by emphasizing the significant elements of the situation and its consequence so that each may serve as a sign. By bringing the signs frequently together a cognitive interest is developed which may become practical if the consequence is sufficiently agreeable. The method is the same when interest is excessive and the situation has no clear meaning.

<sup>1</sup> *cf.* G. Wallas: "Human Nature in Politics," p. 106.

<sup>2</sup> See J. Adams' helpful description of "vanishing point" and "gaping point," "Exposition and Illustration in Teaching," p. 160.



The absorbing situation must be related to the consequence until the meaning becomes conscious. When meaning is thus acquired the situation appeals to practical interest. By presenting difficulties in the situation the teacher reveals the inadequacy of this meaning or of other beliefs taken-for-granted.<sup>1</sup> Hence interest in seeking progressively to overcome these difficulties finds expression in other aggressive forms, such as pursuit, rivalry *et al.*, and thereby develops characteristic behavior toward similar situations. The operations leading to the second attainment must therefore present problematic situations containing such qualities as appeal to these varieties of interest.

The development of interest from one situation to others like it results largely from gratification of curiosity. The interest may therefore be termed cognitive, though other elements as always are included. Recognition of a common quality in new and old situations leads to expectancy of the same consequence that followed the former experience and hence to reproduction of the same activity. The sense of achievement in the sound of an electric bell is expected to follow the pressing of an electric light button. Hence curiosity is a powerful factor in the unification of experience. Here as elsewhere the method of motivation, or operation to be standardized, consists in devising a problem which appeals as worth while and which leads to more effective expression in each type of interest. While this end is partly reached by merely increasing the variety of experience and so revealing the inadequacy of present learning, it is more directly reached by the pupil's independent thought. In either case the new adjustment must be so challenged as to require reflection upon its value. Such reflection implies expression of similar interests in similar situations and possession of "many-sided" knowledge which together constitute the third attainment.

The increasing role of social influences at approximately this stage of the process involves a new function of method,—the direction of activity in all situations toward certain useful ends. As implied by the fourth attainment to which this activity leads, certain situations are taken-for-granted and so become the means by which habitual interests are realized. Other situations less directly related to these interests are still regarded as ends in themselves. Hence this distinction between means and ends observes the distinction previously made between extrinsic and intrinsic interests. The former express an aggressive attitude toward situations that may serve more remote

<sup>1</sup> cf. W. Mitchell, *op. cit.*, p. 292.

personal ends, whether the prevailing interest be intrinsic, practical or rational. The latter express an adaptive attitude toward the nature of the situation, whether this is of interest in a moral or theoretical aspect.

Such methods as may be standardized to motivate this attainment of habitual interest must be selected entirely by individual diagnosis. No general prescription can possibly prove effective. Yet the most obvious implications of the above analysis may help to interpret such diagnosis in selection of method. One such implication is that the more vigorous tendencies revealed by diagnosis should be directed toward ends that can be profitably realized in the given environment. A curriculum consisting of prescribed, experimental, and elective courses<sup>1</sup> does much to indicate the nature of these tendencies<sup>2</sup> and the particular field to be regarded as the pupil's specialty. This should naturally be the field in which interest and ability coincide. Predominant interest in aesthetic appreciation, in rivalry, or in intellectual curiosity, as expressed by various individuals in various school activities, should determine both the teacher's means of approach and the individual's status in the group. Interests most closely identified with the self should when possible be directly furthered by such success as will lead to more remote realizations. This success the teacher can regulate by assigning problems more or less difficult so as to preserve a justifiable feeling of superiority in the special field. Whether the specialty lie in public speaking, or in wood-work, or in the operation of moving picture machines, this fact will determine the motivation of other activity so far as common elements are actually present. While the particular interest thus rendered habitual is not significant, *some* special interest should be successfully expressed. When once this successful expression has become habitual, the interest may seek more distant and more useful ends. Very frequently the reluctance to learn from elders causes indifference to all activities. This can perhaps best be overcome by obtaining influence over leaders of group and by such laboratory methods as give the pupil the advantage of the teacher regarding certain facts.<sup>3</sup> When problems can be thus rationalized in terms of

<sup>1</sup> e.g. as described by C. R. Henderson, *Prin. of Educ.*, p. 492.

<sup>2</sup> Best distinguished perhaps by type of interest as suggested by W. H. Kilpatrick, *N. E. A. Proceedings*, 1918, pp. 528ff.

<sup>3</sup> cf. W. J. McCallister: An Experiment in Use of the Reference Library. *Journal of Experimental Pedagogy*, (London), March, 1917.



extrinsic interest, the operation is likely to be efficient. If the unpleasantness of filthy streets can motivate an intelligent interest in slums, for example, instruction in civics is greatly economized.

The extent to which this direct motivation is possible depends of course upon both pupil and teacher. When the pupil's aggressive interests are sufficiently intense and varied, the teacher may have enough ingenuity to reveal social ends in each spontaneous activity. Yet the limits of human resourcefulness are such that direct motivation of preparatory learning is often wasteful. As Klapper says, "the creation of the conditions that would make motive arise would produce an artificiality similar to learning because of authority." While final acceptance of this view must depend on the success of many current experiments which rely entirely upon direct motivation, it is supported by former explanation of intrinsic social interests. Adaptation to novel situations is usually the immediate effect of authority. Hence the operation which best renders these adaptive interests habitual involves a certain amount of coercion. Activity should accordingly be directed by mediate interest which bears the closest relation to the end proposed. Judged simply as a means of producing temporary conformity the birch is the most effective appeal to this interest. Its inefficiency as a means of moral instruction lies in the resulting feeling of inferiority which negates the cooperative attitude upon which healthy moral interest must depend. Hence the efficient operation by which habitual intrinsic interests are attained would logically consist in the maintenance of *esprit de corps*. Such means of directing interest to the demands of various social situations may well include forms of drill and review where each is motivated so far as possible by mediate interest in success or in novelty of presentation.<sup>1</sup>

The third function of method, which involves the final attainment of the process, is concerned with the appropriate expression of both extrinsic and intrinsic interests. Both must be adjusted to the occasion, *i.e.* to reality. To this end motivation must rely upon the instinctive tendency to compensate for undue expression of either. The educator's problem is to cultivate standards of conduct that shall prevent both the exploitation of easy situations and the complete surrender to others. Each of these attitudes leads to feelings of inferiority;—since gratification of selfish impulse meets the disapproval of the group, and repression of legitimate interests brings the sense

<sup>1</sup> *cf.* means of such motivation by standardized tests. W. S. Monroe: "Measuring the Results of Teaching," p. 79 *et passim*.



of failure. Hence the effect of instinctive compensation is to displace this actual inferiority by the illusion of success. Though the educational process is necessarily the same, it is possible so to modify the resistance that success in some line of endeavor may become actual and so give rise to legitimate feelings of social superiority. The value of this procedure depends upon the degree to which realization of aggressive interests involves expression of adaptive interests also, and vice versa. Whether strictly personal ends are sought in bodily comfort or social ends in community service, the attainment of each should require both aggressive action and deference to social sanctions. Otherwise the response is determined largely by the immediate situation and behavior becomes aimless. By the fullest expression of both attitudes in each situation, the whole of experience is coordinated and directed toward certain ends more or less remote. Hence it follows that the more remote the end, the longer becomes the series of situations through which interest is progressively transferred and the more completely is this interest adjusted to reality.

Otherwise stated, the last of the five attainments proposed involves an operation by which interest is transferred from one to as many situations as possible. Hence the process consists in the formation of ideals. In no other educational product is this phenomenon of transfer clearly apparent.<sup>1</sup> In solving a problem in arithmetic, in kicking a field goal, or in satisfying an importunate friend interest may well be confined to the immediate occasion. Yet when such interest seeks the remote ends of scholarship, sportsmanship, or generosity, its expression is involved in a number of situations that are normally distributed with regard to resistance offered. The ideal of school popularity may well include three. Hence an end remote enough to constitute an ideal is best approached by activity which expresses both extrinsic and intrinsic interests in various situations. The expression of both may be regulated by increasing or decreasing the difficulty of the pupil's problems in such manner as to assist the natural process of compensation. The easy problem fosters aggressive interest and sustains the more remote realization. The difficult problem fosters adaptive interests and demands closer contact with reality. On this account the diffidence of the pupil too guarded in his replies should be overcome by such success as will increase his social status. The assurance of the excessively "original" pupil should be met by such failure as will compel a wider grasp

<sup>1</sup> cf. Ruediger, *Prin. of Educ.*, pp. 112ff.

of reality. Since the mass of the school population distributed between these extremes is composed of individuals requiring adjustment on one side or the other or on both, the operation can be standardized only in so far as the degree of adjustment is approximately the same for different individuals at various stages of development.

While the sequence of these theoretical attainments and of the operations leading to each is intended to follow the course of normal genetic development, it is obvious that such uniform progress along varied lines of experience is conceivable only in theory. As applied to the individual pupil, the processes here related to successive attainments must occur simultaneously as different attainments are reached in various fields of endeavor. Yet even in maturity the development of interest in a new field proceeds from the specific situation to the whole of experience, which may justify the theoretical sequence to some degree.

The hope for standard methods of directing behavior to the most useful development of individual differences, depends for fulfilment upon quantitative description. While as yet few if any "absolute" differences have been adequately described in quantitative terms, it is too soon to predict that correlations between absolute and relative differences may not in time be established which will define the latter more precisely. Progress is most tangible within the field of quantitative experiment. Qualitative analysis, by reason of the personal equation and the number of variables involved, is ever open to question. Yet the belief is legitimate that some such index of relative differences as may be afforded by a synthetic study of interest may hasten the convergence of the two methods of approach. Such study should serve both to stimulate educational research by the contribution of hopeful theory and to standardize intelligent practice as such theory is confirmed.

#### CONCLUSIONS

1. The genetic development of interest as observable in groups provides a basis for standard principles of educational method. When applied to the results of individual diagnosis, these principles effect a useful compromise between traditional methods based on theoretical analysis of socially useful knowledge and experimental methods based on the pupil's preferences or other superficial analysis of behavior.

2. Such principles are useful in selecting cumulative teaching situations or the course of study in so far as typical affective reactions

to particular qualities of a given situation are identified with the pupil's progressive attainments in ideas, skills, habits, etc. These situations may be standardized to the degree that such attainments can be precisely described in terms of process.

3. Methods of motivating the learning process may be standardized to the degree in which the typical interests of various pupils are uniform at approximately the same stage of development. Such uniformity may be assisted by controlling environmental conditions and by grouping with respect to abilities determined by performance tests.



# TESTS FOR THE MEASUREMENT OF CERTAIN PHASES OF LINGUISTIC ORGANIZATION IN SENTENCES

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The evolution of educational measurements is quite definitely a movement away from gross unidentified measures, in the direction of those which are more specific and refined. With one or two exceptions early measuring devices were general in character. Particularly is this true in the case of certain of the content subjects where objective measurement is peculiarly difficult, either because of the absence of specific aims, or the presence of many and conflicting aims. In general, modern tendencies are in the direction of analysis—the careful isolation, identification, and evaluation of the factors involved in the different abilities for the purpose of determining their importance in the desired outcome.

In the field of language, until quite recently, the available measures have been for the most part general, as for example, the scales for the measurement of merit of English composition as developed by Hillegas, Ballou, Willing, and others. The Completion-Test Language Scales standardized by Trabue, the Starch Grammatical Scale A, which is really a measure of ability to choose between certain accepted and certain undesirable language forms, and the more recent language and grammar tests devised by Charters, are all movements in the direction of specific rather than general measures of language. In fact, in the light of past experience, it may be laid down as a principle that progress in the efficient teaching of educational subject matter and the satisfactory measurement of educational products depends upon the degree to which this careful analysis is attempted. In keeping with this movement, the tests described herein represent the outcome of an attempt on the part of the writer to make such an analysis of the factors involved in the field of written expression, and to devise and standardize tests for the measurement of a single phase of one of those factors hitherto unmeasured.

Written composition is only one phase of language ability, but in it is found an unusual complexity of factors. As a starting point for an analysis of the problem some of the following questions might be asked: Just what does a score of 50 or 60 on the Hillegas Scale mean? To what extent is this score due to the material selected?

How much is due to the mechanical elements entering into it? How much is due to the selection of the vocabulary? How much is due to the sentence arrangement? How much is due to the logical arrangement of the thought elements within the sentences and of the sentences within the paragraphs?

The impossibility of answering these questions without further data is apparent, and it was this fact which prompted the writer to attempt the analysis of the factors entering into written expression, and to attempt to devise a means of getting objective data on at least one of these factors. To indicate something of the complexity of the problem the following tentative analysis of language ability is presented. It is crude and incomplete. It is not expected that all the important elements have been included, in fact, a number have been purposely omitted. However, it is felt that the most important and essential ones are included. The separation which is made between oral and written expression in the analysis is for the sake of clearness only.

#### Language Ability

1. Oral expression
  - (a) voice
  - (b) articulation
  - (c) errors in speech—grammatical
  - (d) vocabulary—choice of words
  - (e) audience attitudes and skills
  - (f) logical organization of material
2. Written expression
  - (1) Mechanical factors
    - (a) writing
    - (b) spelling
    - (c) punctuation
    - (d) form and appearance
  - (2) Grammatical factors
  - (3) Rhetorical factors
    - (a) choice of words
    - (b) interestingness of material
    - (c) logical organization of material
      - (a) sentence
      - (b) paragraph
      - (c) Section, Chapter and larger units

Language ability appears in two forms—oral and written. Success in the use of oral language depends on the ability of the user to so choose, arrange and enunciate his words as to affect his hearers in the way in which he intended. In order to guarantee this success,

training and practice in connected thinking and talking are needed. In this training, the development of a pleasant speaking voice, a clear enunciation of words, careful selection and organization of the thoughts or material to be transmitted, should be points of emphasis. In written language, success depends on the writer's ability to so select, organize and clothe his thoughts in words that he affects his readers as he intends. Success in this depends in turn on a large number of factors, chief of which are training and practice in using correct forms of written expression.

There are three main divisions of the problem of written language. The first involves the more formal or mechanical features, such as spelling, punctuation, form and general appearance. The second treats of the grammatical factors, such as the ability to use and recognize certain commonly accepted language forms. The third division is concerned with those more subtle elements of composition, the rhetorical factors, involving the questions of choice of words, interestingness of material, the logical organization of subject matter, etc. In the first two problems we have factors which are more or less uniform in their manner of affecting readers. However, in the third we have factors which do not affect readers in a uniform predictable manner. These variable elements comprise the most important factors of composition, and also are the most elusive to identify and measure.

We have at present scales for the measurement of handwriting, punctuation, grammar, vocabulary, etc., but there are certain elusive elements in each of these which have not yet been measured in an entirely objective manner. As one examines the above analysis more carefully it is noted that the more formal elements of language are the ones which have been measured. There are at present no standards with which to compare form and appearance. There are no suitable devices as yet for measuring the *interestingness* of the material presented; nor for the organization of the material offered. It is a single phase of this last factor—the logical arrangement of the material selected or Organization Ability within the sentence, which it is the purpose of these tests to measure.

To focus directly on the problem; what happens when one is confronted with the situation of thinking clearly and logically on a given subject with a view to expressing himself either orally or in writing on the topic under consideration? If the situation is relatively simple,—a case where the required adjustment may be made



by means of an habitual response, it takes place immediately. However, in a complex situation to which there is no such habitual response, or the one which exists is not satisfying, a real problem arises. As soon as it rises above the plane of the habitual it becomes a focal point of consciously directed energy. That is, attention is voluntarily given to it. In the attempt to reach the solution a large number of ideas associated with the situation are called up. From these ideas, the available material, the suitable and satisfying elements are chosen. From these, organization into a complete logical solution takes place. In written expression this takes the form of logically organized sentences and paragraphs.

For the purpose of obtaining an objective record of this process it is proposed to confront the subject with a limited number of ideas presented in jumbled order, which when properly arranged make a complete logical statement. The measure itself is in terms of the number and difficulty of these re-organization combinations which the subject is able to make correctly in a given period. In a sense it is a test of synthetic ability. To secure the material for these exercises a large number of sentences, for the most part simple straightforward statements of fact with as few qualifying statements as possible, were selected from a number of lower grade readers and primers so that vocabulary difficulties might be eliminated. Every attempt was made to choose sentences the meaning of which would remain clear when they were removed from the context.

In order to secure exercises which would represent quite fully all degrees of difficulty a large number of statements varying in length from very short simple sentences to long and very complex ones were selected. These sentences were then divided into parts in terms of the number of thought units composing them. For example, the sentence "The dog saw his shadow in the water" was divided as follows; the dog; saw; his shadow; in the water. On this basis exercises which could be divided into from three to eleven parts were selected. It is easy to see that suitable exercises of the more complex type were very hard to secure. The elements or thought units comprising the exercises were jumbled as follows: The exercises were first classified as threes, fours, fives, etc., according to the number of elements composing them. The three numbers for the three part sentences were then combined in as many different ways as possible, entirely independently of the sentences. That is, the numbers 1, 2, and 3, were combined in all possible

ways, excluding the combinations where the number one came first. It appeared that allowing the part that normally comes first in a sentence to appear in that order in the test exercise made the problem of getting started into the solution of the exercise too simple. As a result of this decision four such combinations of three numbers were possible: 3-1-2; 3-2-1; 2-3-1; 2-1-3. This type of arrangement was followed throughout the exercises. The longer exercises, of course afforded many more possibilities for combinations, as a study of combinations and permutations will reveal. These number combinations were then paired off with exercises in a random manner, and the number arrangement of that exercise was determined by the number arrangement given it. To illustrate, it may have happened that the number combination 2-4-3-1 was paired with the exercise given above as an illustration of type. The jumbled elements would then be numbered in consecutive order as follows:

(1)	(2)	(3)	(4)
saw,	in the water,	his shadow,	the dog

The object of thus numbering the elements was to permit an objective record of the subject attempt to reorganize the material without making it necessary for him to rewrite the complete sentence. In the case of the above illustration the answer would be recorded as 4-1-3-2. Seventy such exercises were prepared as original material for the tests. These exercises were then mimeographed and sent out to a number of school superintendents and principals who were willing to co-operate in the evaluation of the material. All told 1634 children in grades three to eight were used in the process. The evaluation was accomplished by using the percentage of children solving a given exercise correctly as a basis, and then placing the exercises in their relative positions on a linear scale by the use of the Normal curve of Probability. The method is an application of that used by Dr. Trabue in the development of his Completion-Test Language Scales, and by Dr. Woody in the development of his arithmetical scales.

As a result of the above statistical procedure values ranging from .03 units up to 6.4 units were obtained for the various exercises. In arranging the exercises into the two forms of the tests in which they were standardized the intention was so far as possible to pair off exercises of closely the same value in the two forms. Of two easy exercises of closely the same value, one was placed in Form



A and the other in Form B. They were further selected so that as nearly as possible the two forms comprising ten exercises each would have the same total values. A third consideration was that the two forms should have closely the same inter-exercise interval.

After pairing the exercises the unit values for each of the exercises of each form were converted into point values in such proportion to each other and to the total number of units in the form that the total possible score which may be earned on a given form is 100 points. This seems justified inasmuch as 100 points is a common basis of comparison, and it furthermore eliminates the necessity of changing scores into percentage of total possible score for purposes of comparison.

The present arrangement of the exercises in ascending order of difficulty, and the calculation of the scores in terms of the cumulative values of the exercises solved correctly seems to have certain advantage over the method of stating the score in terms of the last exercise solved correctly. This latter method places the tests in the class of power tests while the use of the cumulative score gives a measure of the rate of work as well as the difficulty of the exercises solved correctly. That is, the arrangement makes possible a combined measure of both rate and power.

The tests as finally developed and standardized are presented on the following pages. It should be said that they represent but a single phase of Organization ability. Sentence organization is in no sense more important than paragraph organization, and it is hoped that ultimately devices for the measurement of the latter ability may be developed, along with more satisfactory methods for the measurement of the former. When the various elements comprising language ability have been isolated and measured there is reason to believe that more specific suggestions based on scientific data rather than on personal opinion may make for the more successful teaching of the subject.

*Instructions to be read aloud by teachers and pupils together.*

This test is given to see how well you are able to arrange groups of words into sentences. To see what the test is like, let us look at this exercise:

(1)      (2)      (3)  
a top,   had,   the little boy

These words, as they are printed, do not make sense. How many see how they could be arranged to make a good sentence? The correct answer is

(3)      (2)      (1)  
"The little boy had a top."



The first exercises in the test are easy, like the one above, but they become harder and harder the farther you go. You are to go as far as you can in five minutes. Do not hurry. You are not expected to be able to do them all, and it is better to have your answers right than to miss a great many exercises. If you finish before the time is up, close your paper and wait quietly.

One thing more. It would take quite a long time to write out the whole of each sentence, so the different groups of words have been numbered. For instance, "the little boy" is number 3. All you need to do is to write the numbers in the proper order after each exercise. What numbers would you write for the exercise above? (Answer 3, 2, 1.) Write them after the exercise. To make sure you understand write the numbers for the answer to this exercise:

(1) (2) (3) (4)  
sing, the children, they, heard,

(When all have found the right answer, give the test, allowing exactly five minutes in all grades.

Answer no questions once the test has been started.)

# ORGANIZATION TEST

(Form A)

Write the numbers  
in these spaces:

- |   |                      |
|---|----------------------|
| (1) (2) (3)   |                      |
| 1. a dog, a boy, had.....                                       | <input type="text"/> |
| (1) (2) (3)   |                      |
| 2. of the cold, afraid, they were.....                          | <input type="text"/> |
| (1) (2) (3)   |                      |
| 3. I am, see, how tall.....                                     | <input type="text"/> |
| (1) (2) (3) (4)   |                      |
| 4. heard, the fly, they, buzz.....                              | <input type="text"/> |
| (1) (2) (3) (4)   |                      |
| 5. wanted, to go home, him, the dog.....                        | <input type="text"/> |
| (1) (2) (3) (4) (5)   |                      |
| 6. and made them, into the palace, their own, took them, they   | <input type="text"/> |
| (1) (2) (3) (4) (5) (6)   |                      |
| 7. go home, the goat, would not, cried, the boy, because....    | <input type="text"/> |
| (1) (2) (3) (4) (5)   |                      |
| 8. of rejoicing, to have, all wanted, they were, a great feast, |                      |
| (6) (7) (8)   | <input type="text"/> |
| that they, and so thankful, so happy.....                       |                      |
| (1) (2) (3)   |                      |
| 9. in England, of the first Thanksgiving Day, the ocean,        |                      |
| (4) (5) (6)   | <input type="text"/> |
| begins, the story, far across.....                              |                      |
| (1) (2) (3) (4)   |                      |
| 10. his brother, Washington, in a railway coach, when, he       |                      |
| (5) (6)   | <input type="text"/> |
| did not ride, went to visit.....                                |                      |

## ORGANIZATION TEST

(Form B)

Write the numbers  
in these spaces:

- (1) (2) (3)
1. a doll, a girl, had.....
- (1) (2) (3)
2. the bridge, went across, the little boy.....
- (1) (2) (3)
3. was, not happy, the queen.....
- (1) (2) (3) (4)
4. to high branch, flew, a mother crow, of the tree.....
- (1) (2) (3) (4)
5. of an old house, with his grandmother, lived, Little Ben,  
(5)  
in the basement.....
- (1) (2) (3) (4)
6. the fire began, then, to burn.....
- (1) (2) (3) (4)
7. was still light, behind the mountains, had sunk, the sun,  
(5)  
but it.....
- (1) (2) (3) (4) (5)
8. Androclus, a poor slave, of Rome, long ago, named,  
(6) (7)  
there lived, in the city.....
- (1) (2) (3) (4)
9. is the story, the noblest, of Indian legends, one of the  
(5) (6)  
finest, of Hiawatha, of Indian chiefs.....
- (1) (2) (3) (4) (5) (6)
10. a white dress, behind, the old woman, with, had on,  
(7) (8) (9) (10) (11)  
a black apron, on her head, and, long strings, a red cap

ANSWER KEY AND SCORE SHEET, FORM B.

KEY:	
Right Answers	Value
1. 2-3-1	.2
2. 3-2-1	2.7
3. 3-1-2	4.4
4. 3-2-1-4	6.4
1-4-2-3	3.2
5. 4-3-2-5-1	9.2
4-3-5-1-2	9.2
5-1-3-4-2	9.2
5-1-4-3-2	4.6
4-2-3-5-1	4.6
6. 3-1-2-4	10.0
1-2-4-3	5.0
1-3-2-4	5.0
7. 4-3-2-5-1	12.8
4-3-5-1-2	12.8
2-3-4-5-1	6.4
8. 4-7-3-6-2-5-1	14.6
4-6-7-3-2-5-1	14.6
6-4-7-3-2-5-1	14.6
6-7-3-4-2-5-1	7.3
9. 4-3-1-5-2-6	18.0
2-3-1-5-4-6	9.0
10. 3-6-1-5-7-	
4-10-2-9-	
11-8 or 8-11	21.7

Standard Scores are as follows:

Grade	3	4	5	6	7	8	9	10	11	12	Total Score
Score	18	26	33	38	42	47	52	59	64	68	



## AN IMPROVED FORM FOR RATING BY THE ORDER OF MERIT METHOD

JOHN L. STENQUIST

*Bureau of Reference, Research and Statistics, Board of Education, New York City*

*Use of Cards in Order of Merit Ranking.*—It is a well known fact among students of mental and social science that to obtain measures of individuals by the so-called "Order of Merit Method," in which names are arranged in order from highest to lowest for the trait consideration, that it is preferable to have the names on individual cards or slips. This contributes to the care and accuracy with which such ranking is done, is more convenient and hence is always advisable. But it is often not practicable to copy names on to cards. Moreover these are cumbersome and not adapted to be easily transported through the mails, which is sometimes necessary. To overcome these disadvantages a special form, which I have called a "Card list" was designed for this purpose. It is printed on heavy paper 9 x 15½ inches, perforated to fold lengthwise in the center. The left-hand half is ruled for entering the list of names to be ranked, such for example, as a class roll. At the left margin are columns for entering the rank number opposite each name. The right-hand half of the form is made up of a continuous row of small separable slips, corresponding in size to the ruling of the opposite side. These are held in place as part of the original sheet until torn apart on the perforation lines.

*Method of Using.*—The method of use is as follows: The sheet is folded vertically on the center perforation line, a carbon paper is inserted and the names entered on the left-hand side as they would be on any sheet, either typed or in pencil. The carbon copy of each name is thus made on an individual separable slip or miniature card. After the names have been entered the person who is to arrange the names in order of merit, simply tears off the duplicate list of separable names and thus has both the original list (which is preferably alphabetical) and also all the duplicate names on individual miniature cards or slips, ready to be sorted. As designed, the form is cut through (slit) between each slip,—the latter being held in place at both ends until torn on perforation lines. The slips can therefore be almost instantly separated, yet are held in proper place while names are entered.

Figure 1 shows the general appearance of this form after the duplicate names have been torn off. The cut is intended to show the process

of arranging the slips in order of merit, by first arranging them into groups, each group to be later classified within itself as is ordinarily done in ranking with cards. The judge is free by this method to re-arrange the names as often as he wishes, without erasing, changing, re-erasing or re-copying the names or the rank numbers as is almost universally the case in ranking by means of a list only.

When the miniature cards or slips have been placed in their final position, the judge turns to the original list (alphabetical) and writes

**"CARDLIST" Combination RANKING CARD**

OF THE JUDGES OF THE AMERICAN JUDGING ASSOCIATION  
—USE IN THE JUDGING ROOM—

Registration No. \_\_\_\_\_ Date \_\_\_\_\_ 19\_\_\_\_

Competition \_\_\_\_\_

Ranked by \_\_\_\_\_

Official Position \_\_\_\_\_

**NAMES**

1	Albright, J. E.
2	Albright, J. E.
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100	Albright, J. E.

**ALPHABETICAL ORDER (UPPER CASES)**

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**RANKS OF MERIT**

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FIG. 1

one opposite the name which is put in his list of slips, two opposite the name which is second in his list of slips, etc. for all the names.

The individual slips may then be re-arranged if other traits are to be judged, otherwise they are merely discarded—and the original list mailed or taken to its destination.

*Chief Advantages and Uses.*—One of the advantages of such a form lies in its novelty, for it is frequently found that a judge who refuses or is disinclined to write names down in order of merit, will do the ranking when presented with this form. It appeals to him as a sort of game. The secret of this is of course that nearly all the

labor has been eliminated for him. The form appeals particularly to foremen and supervisors of industrial plants. The chief advantage however is in the increased care with which rating is done, as compared with merely writing numbers besides names. The judge is forced to pass judgment upon each individual name as he re-arranges it in his new list. It also gives a wider spread of ranks than is generally obtainable with only a list.

There are still a great many situations in which the order of merit method is the only one applicable, and in which such a form is useful. Among these may be mentioned those cases where experiments in mutual rating for personal traits by employees, supervisors, foremen, inspectors, teachers, etc. are being conducted. In the absence of objective measures of many vocational, and moral traits of an individual the necessity for the best possible methods of ranking is apparent. No contention is made that the latter is as desirable as the former, but since in determining most objective measures, such as vocational tests, and scales,—*Judgment by the order of Merit is the Criterion* by which such tests are established, and since the valuation of many traits of individuals in shop, factory and school are still obtainable only by the ranking method, every effort should be made to raise this to as objective a level as possible.

The "Cardlist" combination Ranking Card herein described was used by the writer Mr. John Slawson in an intensive study of the order of Merit Method as applied to the Rating of teachers,<sup>1</sup> and also by Mr. H. A. Toops in practical tests of shopworkmen in factories and laboratories, in New England.

<sup>1</sup> A study of teacher Rating with special reference to the Order of Merit Method—Stenquist & Slawson—Sureau of Reference, Research and Statistics, Board of Education, New York City.



## PUBLICATIONS RECEIVED

HAROLD J. LASKI. *Authority in the Modern State*. New Haven: Yale University Press, 1919. Pp. 398. \$3.00.

This brilliant thinker, who has achieved a reputation on two continents for his trenchant liberalism, here sets forth his ideas of sovereignty under modern conditions. The sovereignty of the state is becoming more and more limited by ethical conceptions, which are evidenced by dissatisfaction with the working of law on the one hand, and the reassertion of natural rights on the other. The state must be subservient to law, and the individual is becoming increasingly the center of social importance. The state exists only as a means to secure freedom for the individual. Its authority is strictly limited by the concensus of ethical opinion of the individuals of which it is composed. Hence if an individual honestly believes that the state is wrong, it is his duty to see that that belief is made public and it is the duty of the state to protect him in the utterance of that belief, even though the general proclamation of it results ultimately in the discrediting of those who at a given time are the state's duly accredited spokesmen.

ALBERT E. MCKINLEY, CHARLES A. COULOMB AND ARMAND J. GERSON. *A School History of the Great War*. Cincinnati: The American Book Company, 1918. Pp. 192.

This little book presents briefly but clearly and succinctly the chief events of the Great War. The commercial, political and psychological conditions of the chief countries of Europe are described, the history of the Balkan wars is sketched, the outbreak of the Great War is portrayed, and the progress of the war is traced year by year. The book is well supplied with sketch maps to show the course of the campaigns.

CHARLES RIBORG MANN. *A Study of Engineering Education*. Bulletin Number Eleven, Carnegie Foundation for the Advancement of Teaching, 1918. Pp. xi, 139.

The aim of this report is not so much to record the details of engineering teaching in the various schools, as to examine the fundamental question of the right methods of teaching and of the preparation of young men for the engineering professions, to question the pedagogic practice of the past fifty years, whereby the first two years of the engineering course were devoted to the study of the fundamental sciences (chemistry, physics, mathematics and mechanics)

and the last two years to the applications of these sciences to theoretical and practical problems. Professor Mann argues that theory and practice should be taught simultaneously. The splitting up of mathematics, for example, is a source of weakness from the standpoint of the student's needs. Many students, who might make good engineers, are eliminated from the schools by failure in the fundamental subjects long before they have a chance to know what engineering is. An interesting part of the report is the description and discussion of the diagnostic value of fifteen objective tests proposed by Professor Thorndike to reveal the engineering ability of students. Of the thirty-four men tested at Columbia, five of the seven who stood highest received general honors at the end of the third year, while five of the seven lowest failed in more than half their work and left school. Partial correlation coefficients show that the results from seven of the tests give a better indication of engineering ability than the entire fifteen.

FLORENCE MATEER. *The Diagnostic Fallibility of Intelligence Ratios*. Reprinted from the *Pedagogical Seminary*, Vol. 25: 1918, 369-392.

Terman and others have made the claim that the I. Q. remains practically constant at all chronological ages. A child who has an I. Q. of 95 at seven years of age will have the same I. Q. at twelve. On the basis of the examination of fifteen children with an interval of from two months to five years between the examinations the author denies that this is true. In practically every case there was a reduction of the I. Q. and in some instances this reduction amounted to as much as thirty points. The author contends that neither the I. Q. nor the mental age *per se* can be taken as a basis for a differential diagnosis.

GEORGE A. MIRICK AND BURTON HOLMES. *Home Life Around the World. A Geographical Reader for the Fourth Grade*. Cincinnati: American Book Company, 1918. Pp. x, 163. \$0.64.

This admirable reading book starts with Peary at the North Pole, then goes down through the reindeer herds of Lapland and the cow herds of Switzerland to the caravans of Sahara. Then we go off to the Amazon, back to Ceylon, up to Hawaii, and finally back to America, where glimpses are caught of many parts of this broad land. The pictures selected by Burton Holmes, add much to the attractiveness of the book.

PERLEY OAKLAND PLACE. *Beginning Latin. An Introduction by way of English to the Latin Language.* Cincinnati: American Book Company, 1919. Pp. xviii, 398.

The aim of this book is to increase the interest and pleasure of the first year of Latin, to aid the learning of Latin by the help of English and of English by the help of Latin, and to impart even to the beginner some vivid suggestion of the civilization attained by Rome. To do this the author begins with words closely related to English words, introduces games, short anecdotes, celebrated bits of Latin, much historical material, and very many pictures. There is a picture on almost every page, presenting some phase of Roman life or Roman art.

HOWARD C. WARREN. *Mechanism versus Vitalism in the Domain of Psychology.* Reprinted from the *Philosophical Review*, Vol. 27, 1918. 597-615.

An examination of the various theories of vitalism advanced by Ritter, Driesch, Bergson, McDougall, and Henderson from the point of view of psychology. The author defends the mechanistic interpretation of human behavior.

JULIUS E. WARREN. *Selections from Browning.* Cincinnati: The American Book Company, 1918. Pp. 169.

Selections from Browning's shorter poems for use in high school.

*Webster's New Handy Dictionary.* New York: American Book Company, 1918. Pp. viii, 278. \$0.32.

*Whittier State School, Fourteenth Biennial Report, 1916-1918.* Pp. 129.

An interesting phase of the report of the Department of Research is an attempt to work out a scale of seven points to indicate the temperaments of the boys. Other items of the report are the intelligence quotients of 251 entrants, methods used by field workers in tracing hereditary connections of boys, the grading of homes and neighborhoods, the application of findings in vocational guidance, and outside surveys. It is evident that Whittier School is fully sustaining its reputation as one of the most aggressive and progressive institutions in the country.

JOHN MILLS. *The Realities of Modern Science.* New York: The MacMillan Company, 1919. Pp. xi, 327. \$2.50.

A modern picture of molecules, atoms, electrons and energy;—science made interesting to the student of affairs. The general reader



who has been amazed by the variety of the recent applications of science will find here a synthesis which will orient him in modern science. The earlier chapters develop the fundamental concepts in their historical and social setting. Later chapters introduce their quantitative relationships and will appeal to those who wish an exact but easily comprehensible treatment.

TSUNEKICHI MIZUNO. *The Kindergarten in Japan*. Boston: The Stratford Company, 1917. Pp. 64. \$0.75.

An investigation of the effect of the kindergarten upon the physical, mental and moral traits of Japanese children. There is an account of the historical development of the kindergarten and an interesting sketch of the kindergarten in Japan. As a result of a questionnaire study in which returns were received from 269 teachers the author concludes that kindergarten children are superior to non-kindergarten children in scholarship, understanding, memory, and all that concerns the intellectual activities; that they are inferior in capacity for sustained effort and diligence; that they are inferior in many moral habits, as disorderliness, inattention, talkativeness, disobedience, etc.; and that they are not superior in physical capacity and bodily health.

WALTER S. MONROE. *The Derivation of Reasoning Tests in Arithmetic*. *School and Society*, Vol. 8, 1918, 295-299; 324-330.

The problems in eight widely used texts were classified according to the number of steps involved and the operation called for in each step. A further analysis was made with reference to the different types of reasoning situation. One hundred and six types were distinguished, and twenty-six of these occurred in all of the nine texts. The subtraction-multiplication type has a frequency more than twice that of any other. The criterion adopted for technical terminology was that used in the majority of the texts. The difficulty of problems was evaluated on the basis of per cent of solutions correct in principle in terms of sigma. On these basic principles the author proposes to construct a scale for the measurement of ability to solve problems in arithmetic.

WALTER S. MONROE. *Studies in Arithmetic*. Indiana University Studies, No. 38. 1918. Pp. 40. \$0.35.

This is the third report on the measurement of arithmetical abilities in Indiana cities according to the Courtis Standard Research Tests, Series B. Returns were received from twenty-seven cities

and towns, including 5472 pupils. Detailed tables are given showing attempts, rights and percentage of accuracy for each fundamental operation. There is wide variation of achievement in different cities, some showing more than twice as high a score as others for a given grade. The scores are markedly lower than those obtained from Indiana cities in 1914 and 1915, but it must be kept in mind that these scores are from a wholly different group of smaller towns than the previous records. In any case it is clear that these towns are far below the Courtis standards and the medians obtained in other Indiana, Iowa and Kansas cities.

W. B. MOONEY. *A Self-Survey of the Sterling Public Schools, District Number 12, Logan County, Colorado, Colorado State Teachers' College Co-operating.* Colorado State Teachers' College Bulletin, August, 1917. Pp. 82.

The Kuhlman revision of the Binet tests was given to 121 selected children, and the Terman revision to 258 unselected children of the first three grades. On the basis of the results a special class was formed, but discontinued after one term on account of lack of funds. In the school subjects the Courtis Arithmetic Tests, Series B, the Starch Arithmetical Reasoning Scale A, the Gray Oral Reading Scale, the Kansas Silent Reading Tests, the Courtis Spelling Tests, and the Thorndike Handwriting Scale were used to measure the attainments of the pupils. Among the results noted were the stimulation of the teachers, the setting of more precise standards, and recognition of specific weaknesses.

GARRY C. MYERS. *Some Variabilities and Correlations in Learning.* Reprinted from the American Journal of Psychology, Vol. 29, 1918. Pp. 316-326.

After the first few trials one performance measures capacity about as well as any other. There is practically no correlation between card sorting and intelligence at any stage in the series of practices. Practice does not make the individuals more or less alike. Doubtless one or a few trials in the average mental test is about as good as an infinite number of trials.

ALICE M. NASH AND S. D. PORTEUS. *Educational Treatment of Defectives.* Reprinted from the Training School Bulletin, November, 1919. Pp. 19. \$25.

What is to be done with the special classes after we have them segregated: Some teachers seem to be trying to teach them regular subjects about as they would normal children. The present mono-



graph relates the experience of Vineland teachers in a variety of subjects, and should be most useful to all teachers of special classes. No pupil who has an I. Q. of 50 or less should be taught any school subject. The subjects discussed include needlework, woodwork, domestic training, basketry, shoe mending, etc. "One of the biggest lessons that we must all learn is that a defective is a defective, and not to be made over into a competent, self-supporting workman in a skilled trade . . . . Herein lies the tragedy of the whole matter—that so much wonderfully fine human endeavor is going to waste because those who are responsible for the present system are exercising no more fore-thought for the future of the defective than the defective himself displays. Truly, the blind lead the blind."

W. D. PARTLOW AND THOMAS H. HAINES. *Mental Rating of Juvenile Dependents and Delinquents in Alabama*. Reprinted from the *Journal of Applied Psychology*, Vol. III, 1919. Pp. 292-309.

This paper presents the results of a survey of the four industrial schools of Alabama by a group intelligence test similar to the Alpha-Army Tests. At the same time the tests were given to 1012 white and 765 colored children of the schools of Jackson, Miss. Only eight of the 307 white delinquent boys were up to the expected school grade. The following percentages of delinquents score below the 50 per cent level of public school children: White boys 86 per cent, white girls 99 per cent, colored boys 84 per cent.

*The Professional Preparation of High School Teachers*. Eighteenth Yearbook of the National Society for the Study of Education, 1919. Pp. 372. \$1.50.

Among the many special papers in this valuable symposium the following may be mentioned: H. L. Miller, University of Wisconsin "Plan for the Preparation of High School Teachers" (Directed Teaching, Preparation Through Participation, Comments from Students); T. W. Gosling, "The Selection and Training of Teachers for Junior High Schools;" S. S. Colvin. "The Lesson Plan and Its Value to the Student Teacher;" L. V. Koos, "The Training of Teachers in the Accredited High Schools of the State of Washington;" S. S. Colvin, "The Most Common Faults of Beginning High School Teachers;" George N. Cade and William S. Gray, "Objective Studies of the Achievements of Training School and Public School Pupils in the Freshman Year of the High School;" A. R. Mead, "Methods of Selection and Supervision of Practice Teachers;" Fred C. Whitcomb, "Practice Teaching in the Manual Arts and Industrial Education;" Charles



Fordyce, "Correlation between General Teaching Power and some Specific Teaching Qualities."

*School Report of the Town of Southington, Connecticut, 1919.* Pp. 70. In this interesting report Superintendent Witham presents the results of the Monroe Silent Reading Tests No. III, to 198 high school pupils: the Ayres spelling test in elementary schools; the Jones 100 Spelling "Demons" in the high school; the Monroe Arithmetical Reasoning test in the seventh grade; the Courtis Arithmetic test, Series B, to the high school freshmen commercial class; the Trabue Language Scale B in the eighth grade; and a very interesting Southington English Vocabulary test to the elementary grade. The latter test consisted of ninety words from the Ayres Spelling list and ten words from the Thorndike Visual Vocabulary list. This deserves more extended comparison with other vocabulary lists.

DANIEL STARCH. *Educational Psychology*. New York: The MacMillan Company, 1919. xii, 473. \$3.00.

"The preparation of this book has been carried out according to two fundamental purposes: First, to present that material which seems to be most useful and relevant to the problems of educational psychology; and, second, to maintain a strictly experimental, scientific viewpoint in discussing these problems." The book is divided into three parts. Part I deals with the native equipment of human beings, including instinctive elements, variation in and correlation among capacities, sex differences, the inheritance of mental traits and their measurement. Part II considers the general psychology of learning, the analysis of problems, the reception of stimuli (sensory defects, perception and observation), rate and progress of learning, how to study, and transference of training. Part III takes up the psychology of learning in school subjects, and gives a detailed account of the recent investigations in reading, writing, spelling, language, arithmetic and history. In his discussion of native equipment the author follows Thorndike in rejecting the old formal groupings and lists Thorndike's forty-two types of instinctive reactions. He points out that instincts as such have very little significance for education, and that the chief educational doctrines based upon instincts (dynamic theory of instincts, transitoriness, and recapitulation) have very little justification in verified fact. This is a sane view, and we hope that it will tend to neutralize the overemphasis of instincts that has been prevalent in educational discussions since James. The chapters on the inheritance and measurement of mental characters give an excellent

résumé of the scattered literature, and cogently reinforce the view that environment can do no more than offer opportunities for the development of inherent tendencies. The discussion of transfer is very complete and exhaustive, showing that experimental studies of transfer vary from zero to twenty per cent, depending upon the closeness of relation between the two types of activity. The third part, to which almost 200 pages are devoted, gives a résumé of the results of experimental studies in school subjects which has never before been attempted in a text on educational psychology. While the authors' limitations of space made selection necessary, the picture of school learning in the subjects treated is fairly complete. There is a bibliography of fourteen pages.

BERNARD C. STEINER. *Life of Henry Barnard, the First United States Commissioner of Education, 1867-1870*. Washington: Bureau of Education, Bulletin, 1919, No. 8. Pp. 131. Fifteen Cent.

In spite of the general recognition that Henry Barnard was one of the most influential American educators of last century, he has had no adequate biography. We have here only a biographical sketch, but it brings together data from many widely scattered sources and makes it readily available to the student.

ARTHUR H. SUTHERLAND. *Ungraded Rooms in Los Angeles City Schools*. First Annual Report of the Division of Psychology. School Publication No. 24, 1919. Pp. 36.

This report gives an account of a survey of 2000 children in ungraded rooms, a plan for the organization of ungraded or adjustment rooms, and (of especial interest) a plan for development rooms and development schools. The course of study is given in some detail, and stimulating suggestions are made for dealing with dull and defective pupils. There is also an analysis of the reading material in eleven widely used Fourth Readers.

J. E. WALLACE WALLIN. *The Achievement of Mental Defectives in Standardized Educational Tests*. School and Society, Vol. 10, 1919, 250-256.

The Ayres and Starch spelling tests, the Gray oral reading scale, and the Cleveland arithmetic tests were used in a survey of the St. Louis special schools for mental defectives. Many special disabilities in reading, spelling and arithmetic were noted, with much greater variability than among normal children.

HOWARD C. WARREN. *A Classification of Reflexes, Instincts and Emotional Phenomena*. Reprinted from the *Psychological Review*, Vol. 26, 1919. Pp. 197-203.

The author comments on the fact that nowhere in the literature is there to be found a systematic classification of the reflexes. Sixty-six reflexes are listed, divided into five groups. The classification rests on their degree of freedom from central modification. The instincts are classified as nutritive, reproductive, defensive, aggressive and pertaining to social organization. There are six instinctive tendencies indicated, six classes of emotions, and six groups of human dispositions.

JOHN B. WATSON. *Psychology from the Standpoint of a Behaviorist*. Philadelphia: J. B. Lippincott Company, 1919. Pp. xiii, 429.

This is the book for which those who have followed the controversy between the behaviorists and the introspectionists have long waited. In this book is set forth what the behaviorist means by psychology. "The young student of behavioristic psychology has to endure no holy vigil before beginning to use psychological material and methods, nor does he at any time have to pass through secret initiation ceremonies before beginning research work. The key which will unlock the door of any other scientific structure will unlock the door of psychology. The differences among the various sciences now are only those necessitated by the division of labor. Until psychology recognizes this and discards everything which cannot be stated in the universal terms of science, she does not deserve her place in the sun. Behavior psychology does make this attempt for the first time. It has been called physiology, muscle-shackles of the present-day conventional psychology and teaches twitch psychology, and biology, but if it helps us to throw off the us to face the human being as he is and to deal frankly with him, what name it is given will not be a matter of much consequence . . . The present volume does some violence to the traditional classification of psychological topics and to their conventional treatment. For example, the reader will find no discussion of consciousness and no reference to such terms as sensation, perception, attention, will, image and the like. These terms are in good repute, but I have found that I can get along without them both in carrying out investigations and in presenting psychology as a system to my students. I frankly do not know what they mean, nor do I believe that any one else can use them consistently. I have retained such terms as thinking and memory, but I have carefully



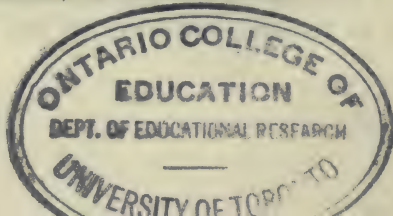
redefined them in conformity with behavioristic psychology. It is possible to retain attention, to redefine it, and make it serve as a framework for presenting certain aspects both of the acquisition of any given type of organization and its later functioning. I have not done so because in an elementary text the less abstracting of partial functions one can make the better is the result for the student." This general point of view is further elaborated in the first two chapters on problems and scope of psychology, and psychological methods. There follow chapters on the receptors, on the neuro-psychological basis of action, on muscles and glands (a most important discussion), on emotions, on instinct, on bodily habits, on language habits, on work, and on personality. The chapter on language habits is one of the most interesting in the entire book.

OSCAR H. WILLIAMS. *Syllabus of European History*. Cincinnati: American Book Company, 1918. Pp. vi, 97.

A basic outline of a course in European history from Charlemagne's time to the present.

HERBERT WOODROW. *Brightness and Dullness in Children*. Philadelphia: J. B. Lippincott Company, 1919. Pp. 322.

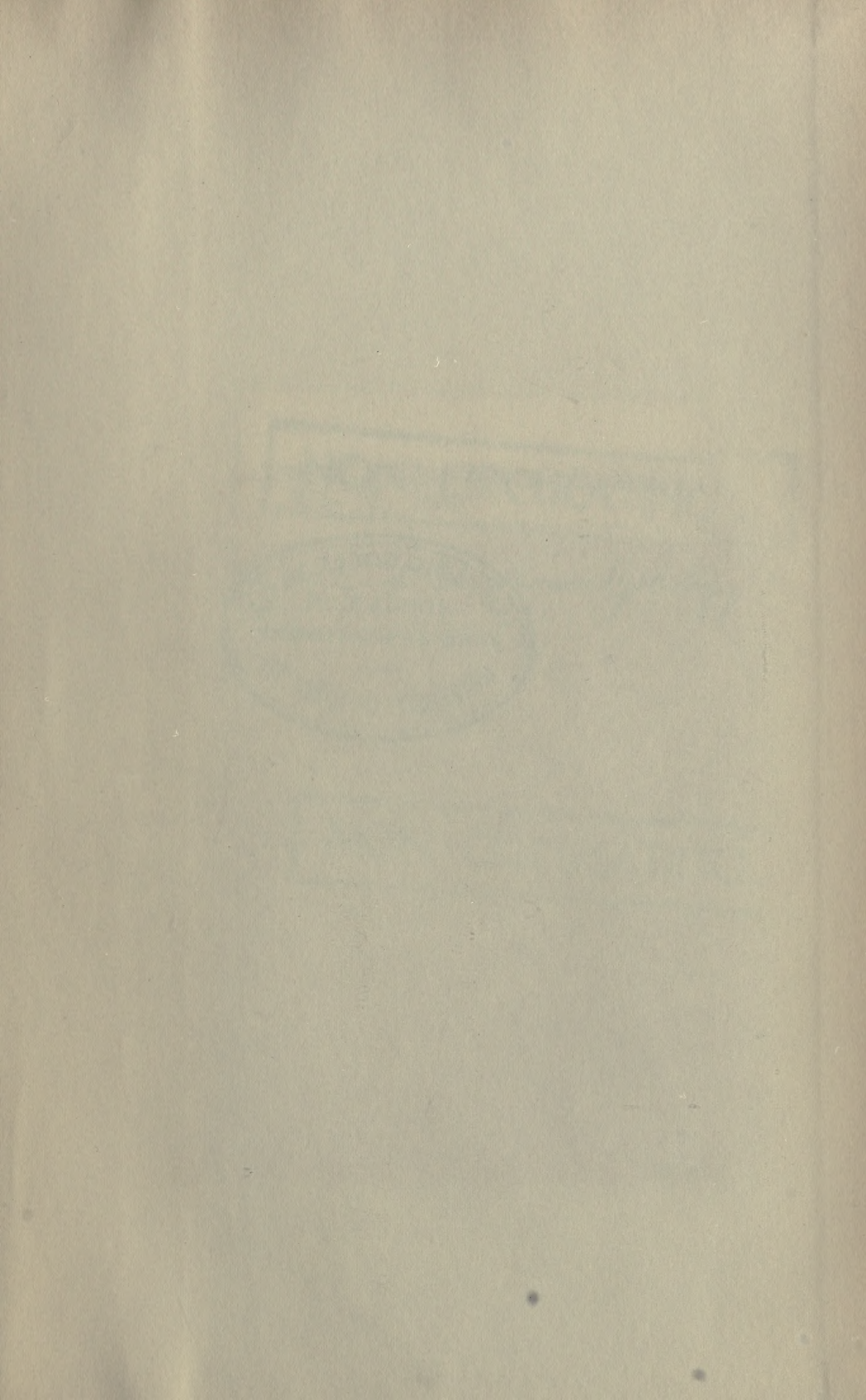
"The teacher of today needs a knowledge of the modern psychology of intelligence. She must know when it is desirable to try to bring a backward pupil up to grade, and when it is not, and why it usually is not. She should realize that the exceptionally bright child who seldom troubles her may be her greatest problem. She should understand the sources of the errors teachers often make in their estimates of brightness and dullness, such, for instance, as the failure to take properly into account differences in age. She should be familiar with the concept of mental age and with the method of classifying children as superior, dull, or normal by its aid more accurate than in any other manner . . . She must know that innate brightness and dullness can be recognized at an early age, and that they demand recognition as fundamental factors in the determination both of the general school organization and of educational methods. Clearly, the science of education depends upon, and finds its surest foundation in, the science of intelligence." The present book might well be called an introduction to the science of intelligence. The teacher will here find the digested results of intelligence studies presented in readable form.















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